4. Energy Efficient Mobility Systems

The Vehicle Technologies Office (VTO) supports research, development, deployment, and demonstration (RDD&D) of new, efficient, and clean mobility options that are affordable for all Americans. The office's investments leverage the unique capabilities and world-class expertise of the national laboratory system to develop new innovations in vehicle technologies, including: advanced battery technologies; advanced materials for lighter-weight vehicle structures and better powertrains; energy-efficient mobility technologies and systems (including automated and connected vehicles as well as innovations in connected infrastructure for significant systems-level energy efficiency and improvement); combustion engines to reduce greenhouse gas (GHG) emissions; and technology deployment and integration at the local and state level. In coordination with the other offices across the Office of Energy Efficiency and Renewable Energy (EERE) and the U.S. Department of Energy (DOE), the Vehicle Technologies Office advances technologies that assure affordable, reliable mobility solutions for people and goods across all economic and social groups; enable and support competitiveness for industry and the economy/workforce; and address local air quality and use of water, land, and domestic resources.

The Energy Efficient Mobility Systems (EEMS) subprogram supports research, development, and demonstration of innovative mobility solutions that improve the affordability, accessibility, and energy productivity of the overall transportation system. EEMS leverages emerging disruptive technologies such as connected and automated vehicles, information-based mobility-as-a-service platforms, and artificial intelligence (AI) based transportation control systems to accelerate the transition to a zero carbon-emission transportation future. The EEMS subprogram also develops and utilizes large-scale transportation modeling and simulation capabilities to evaluate the impacts of new mobility solutions across multiple geographies and populations, ensuring that all Americans, especially underserved and energy communities, benefit from the development and deployment of clean transportation technologies.

The EEMS subprogram consists of two primary activities: Computational Modeling and Simulation, and Connectivity and Automation Technology. The subprogram's overall goal is to identify feasible system-level pathways and develop innovative technologies and systems that can dramatically improve mobility energy productivity (MEP) for individuals and businesses when adopted at scale. The EEMS subprogram has developed a quantitative metric for MEP, which measures the affordability, energy efficiency, convenience, and economic opportunity derived from the mobility system. The metric, while encompassing multiple vehicle classes and modes for passenger and goods movement, is used by the subprogram to evaluate success and by the transportation community to inform planning decisions. The EEMS subprogram's target is a 20% improvement in MEP by 2040 relative to a 2020 baseline.

Project Feedback

In this merit review activity, each reviewer was asked to respond to a series of questions, involving multiple-choice responses, expository responses where text comments were requested, and numeric score responses (on a scale of 1.0 to 4.0). In the pages that follow, the reviewer responses to each question for each project will be summarized: the multiple choice and numeric score questions will be presented in graph form for each project, and the expository text responses will be summarized in paragraph form for each question. A table presenting the average numeric score for each question for each project is presented below.

Table 4-1 – Project Feedback

Presentation ID	Presentation Title	Principal Investigator (Organization)	Page Number	Approach	Technical Accomplishments	Collaboration	Future Research	Weighted Average
EEMS013	ANL Core Tools-Simulation	Phil Sharer (Argonne National Laboratory)	4-8	3.63	3.75	3.63	3.38	3.66
EEMS037	Big Data Solutions for Mobility 2.0	Jane Macfarlane (Lawrence Berkeley National Laboratory)	4-12	3.38	3.50	3.00	3.50	3.38
EEMS041	ANL Everything-in-the-loop (XIL) Capabilities	Kevin Stutenberg (Argonne National Laboratory)	4-15	3.80	3.70	3.80	3.50	3.71
EEMS066	Livewire Data Platform-A Solution for Energy Efficient Mobility Systems (EEMS) Data Sharing	Lauren Spath-Luhring (National Renewable Energy Laboratory)	4-19	3.40	3.40	3.40	3.25	3.38
EEMS090	Applying Artificial Intelligence (AI) Based Signal Coordination and Controls for Optimized Mobility for the Nimitz Highway	Hong Wang (Oak Ridge National Laboratory)	4-23	3.38	3.38	3.50	3.00	3.36

Presentation ID	Presentation Title	Principal Investigator (Organization)	Page Number	Approach	Technical Accomplishments	Collaboration	Future Research	Weighted Average
EEMS092	BEAM CORE	Anna Spurlock (Lawrence Berkley National Laboratory)	4-27	3.60	3.80	3.60	3.38	3.69
EEMS093	Transportation System Impact POLARIS Workflow Development Implementation and Deployment	Joshua Auld (Argonne National Laboratory)	4-32	3.70	3.70	3.90	3.50	3.70
EEMS094	Development and Validation of Intelligent CAV Controls for Energy-Efficiency and ENACTED	Dominik Karbowski (Argonne National Laboratory)	4-37	3.63	3.50	3.50	3.25	3.50
EEMS095	Integrated Control of Vehicle Speeds and Traffic Signals for Reducing Congestion and Energy Use	Jinghui Yuan (Oak Ridge National Laboratory)	4-41	3.60	3.70	3.80	3.30	3.64
EEMS097	Micromobility-Integrated Transit and Infrastructure for Efficiency (MITIE)	Andrew Duvall (National Renewable Energy Laboratory)	4-45	3.17	3.33	3.50	3.00	3.27
EEMS098	Optimizing Drone Deployment for More Effective Movement of Goods	Victor Walker (Idaho National Laboratory)	4-49	3.50	3.50	3.50	3.17	3.47
EEMS099	Metrics for Assessing the Impacts of Energy-Efficient Mobility Systems	Venu Garikapati (National Renewable Energy Laboratory)	4-53	3.25	3.13	3.13	2.50	3.14
EEMS100	Dynamic Curb Allocation	Nawaf Mohammed (Pacific Northwest National Laboratory)	4-57	3.50	3.63	3.50	3.13	3.52

Presentation ID	Presentation Title	Principal Investigator (Organization)	Page Number	Approach	Technical Accomplishments	Collaboration	Future Research	Weighted Average
EEMS101	RealSim, An Anything-in-the-loop Platform for Mobility Technologies	Max Chen (Oak Ridge National Laboratory)	4-61	3.63	3.63	3.50	3.75	3.63
EEMS105	Energy Optimization of Light- and Heavy-Duty Vehicle Cohorts of Mixed Connectivity Automation and Propulsion System Capabilities via Meshed V2V-V2I and Expanded Data Sharing	Darrell Robinette (Michigan Technological University)	4-64	3.50	3.67	3.33	3.00	3.57
EEMS106	Developing an Energy-Conscious Traffic Signal Control System for Optimized Fuel Consumption in Connected Vehicle Environments	Mina Sartipi (University of Tennessee Chattanooga)	4-67	3.40	3.30	3.80	3.17	3.40
EEMS107	Improving network-wide fuel economy and enabling traffic signal optimization using infrastructure and vehicle-based sensing and connectivity	Joshua Bittle (University of Alabama)	4-72	3.17	3.17	3.33	3.00	3.19
EEMS108	Co-Optimization of Vehicles and Routes	Nick Hertlein (PACCAR)	4-76	2.67	3.00	3.17	N/A	2.93
EEMS109	Connected and Learning Based Optimal Freight Management for Efficiency	Ali Borhan (Cummins)	4-79	3.67	3.33	3.33	3.50	3.44

Presentation ID	Presentation Title	Principal Investigator (Organization)	Page Number	Approach	Technical Accomplishments	Collaboration	Future Research	Weighted Average
EEMS110	Human Factors and Technologies Design to Improve User Acceptance of Pooled Rideshare (PR) for Increasing Transportation System Energy Efficiency	Yunyi Jia (Clemson University)	4-82	3.50	3.75	3.38	3.50	3.61
EEMS112	NREL Core Modeling & Decision Support Capabilities (RouteE FASTSim OpenPATH T3CO)	Jeff Gonder (National Renewable Energy Laboratory)	4-86	3.50	3.50	3.50	3.30	3.48
EEMS113	Testing and Evaluation of Curb Management and Integrated Strategies to Catalyze Market Adoption of Electric Vehicles	Lauren Harper (Los Angeles Cleantech Incubator)	4-91	3.40	3.40	3.40	3.30	3.39
EEMS114	Real Twin	Ross Wang (Oak Ridge National Laboratory)	4-95	3.63	3.88	3.75	3.63	3.77
EEMS115	Modeling Connected and Automated (CAV) Compute Power	Ben Feinberg (Sandia National Laboratories)	4-99	3.25	3.50	3.13	2.75	3.36
EEMS116	High-Quality Perception Data	Zach Asher (Western Michigan)	4-102	3.00	3.17	3.17	2.83	3.08
EEMS117	Visual-Enhanced Cooperative Traffic Operations (VECTOR) System	Achilleas Kourtellis (University of South Florida)	4-107	2.13	2.25	2.38	2.50	2.27

Presentation ID	Presentation Title	Principal Investigator (Organization)	Page Number	Approach	Technical Accomplishments	Collaboration	Future Research	Weighted Average
EEMS118	AI-Based Mobility Monitoring System and Analytics Demonstration Pilot	Scott Samuelson (University of California Irvine)	4-111	3.50	3.50	3.67	3.67	3.54
EEMS119	Improved Mobility and Energy Savings Through Optimization of Cooperative Driving Automation (CDA) Application for Signal Controls for Arterial Mixed Traffic Scenarios	Xiao-Yun Lu (Lawrence Berkeley National Laboratory)	4-115	3.38	3.38	3.25	3.13	3.33
EEMS120	A Cooperative Driving Automation (CDA) Framework for Communications	Adian Cook (Oak Ridge National Laboratory)	4-119	3.50	3.83	3.50	3.33	3.65
EEMS121	Decentralized and Cooperative Traffic Signal Network for Freight Energy Efficiency Safety Sustainability and Public Health	Michael Lim (Xtelligent)	4-122	3.00	3.13	2.88	3.25	3.08
EEMS122	Pathways to Net Zero Mobility	Joshua Auld (Argonne National Laboratory)	4-126	3.50	3.75	3.50	3.63	3.64
EEMS123	Freight in the Loop	Kevin Stutenberg (Argonne National Laboratory)	4-131	3.67	3.50	3.33	3.67	3.54

Presentation ID	Presentation Title	Principal Investigator (Organization)	Page Number	Approach	Technical Accomplishments	Collaboration	Future Research	Weighted Average
EEMS124	Deployment of Real-Sim/Real-Twin Scenario Library Generation and Benchmark of Energy Centric CAV Controls	Ross Wang (Oak Ridge National Laboratory)	4-134	3.33	3.17	3.17	3.33	3.23
EEMS125	Energy Metrics in Traffic Signal Performance Measures	Joseph Fish (National Renewable Energy Laboratory)	4-137	3.00	3.00	3.00	3.00	3.00
EEMS126	Arena Mobility Hubs for an Equitable Low-Carbon Future	Jeff Baer (The EV Button)	4-140	1.67	1.50	2.33	1.83	1.69
EEMS127	Deploying Autonomous On-Demand Energy Efficient Mobility Solutions in Tulsa's Underserved Communities	Samitha Samaranayake (Cornell University)	4-143	3.17	3.00	3.50	3.00	3.10
EEMS128	National Impacts of Community-Level Strategies to Decarbonize and Improve Convenience of Mobility	Christopher Hoehne (National Renewable Energy Laboratory)	4-146	2.50	2.75	3.50	2.75	2.78
EEMS129	Using Artificial Intelligence to Predict Ridership and Optimize Shared Mobility	Josh Rands (Terracity)	4-149	2.83	2.50	3.17	3.25	2.71
Overall Average				3.29	3.33	3.36	3.19	3.31

Presentation Number: EEMS013
Presentation Title: ANL Core Tools-Simulation
Principal Investigator: Phil Sharer, Argonne National Laboratory

Presenter

Phil Sharer, Argonne National Laboratory

Reviewer Sample Size

A total of four reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

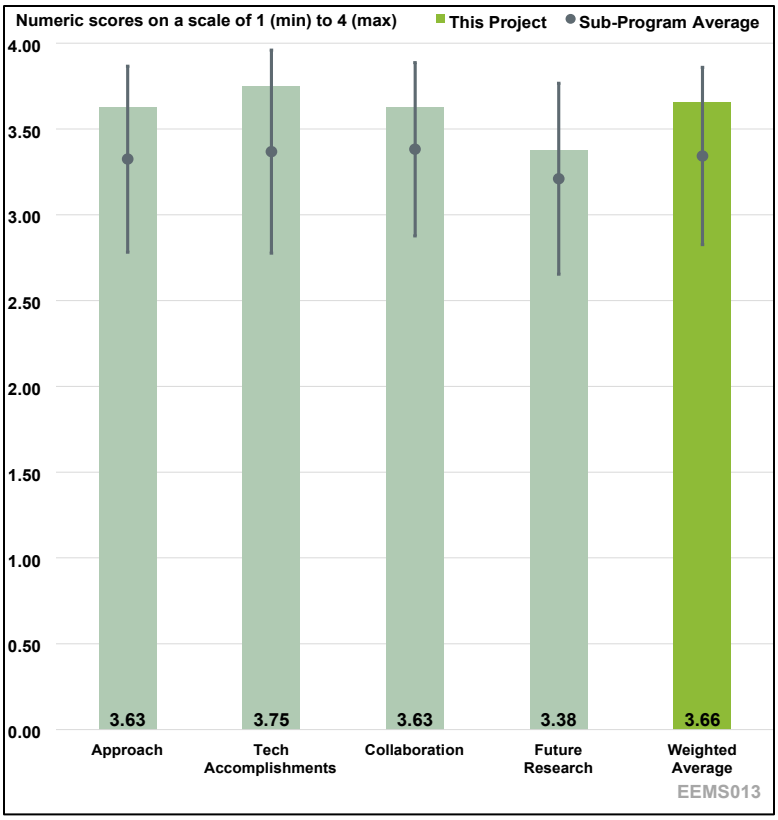

Figure 4-1. Presentation Number: EEMS013 Presentation Title: ANL Core Tools-Simulation Principal Investigator: Phil Sharer, Argonne National Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The project approach is excellent and has resulted in successful execution of this project that is 80% complete.

Reviewer 2

The reviewer commented that the continued expansion of the user base will be important in establishing the core Autonomie suite as a consensus tool for developing and analyzing decarbonization strategies, in a manner similar to how, Greenhouse gases, Regulated Emissions, and Energy use in Technologies (GREET) is now widely accepted.

Reviewer 3

The reviewer liked the approach of reusing and building new tools from the strong existing foundation and highlighted how the presenter mentioned in his presentation “Rinse and Repeat”. The reviewer liked how it was discussed on who and how the tools where used. The reviewer said that a little more detail on some of the results and findings that came directly from these tools being available would be good to see. The reviewer encouraged a bit of a victory lap or pat on the team’s back in addition to Slide 27 in the material.

Reviewer 4

The reviewer noted that lots of scenarios are baked in and available to explore in the software runs. The reviewer added that no barriers seem to be in evidence there. The reviewer continued by saying that one of the chief challenges of modeling tools like this is remaining up to date when the vehicle technologies themselves are dynamically evolving. The reviewer stated that having gone out to the free versions available to inspect, it is impressive that the scenarios offered include virtually every configuration available for different vehicle types, fuel types, etc. The reviewer continued by stating that a kind of content maintenance and integration is critical to the ongoing relevance of the tool.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer stated that the progress especially with regard to both Aeronomie and advanced model-based engineering resource (AMBER) is outstanding, and sustained efforts at validation will be critical.

Reviewer 2

The reviewer noted that the project has done an outstanding job at integrating the suite of tools that are developed and maintained by Argonne National Laboratory (ANL).

Reviewer 3

The reviewer stated that a little more description of Autonomie AI and Express would be helpful. They added that it was hard to see exactly how they differ, why each is needed, and who would use them.

Reviewer 4

The reviewer commented that with the materials presented, it is not possible to draw clear comparisons between the nuances of the project plan and what has been executed against it. They added that the team does an impressive job of horizon-scanning about vehicle technologies and building tools that keep pace with and perhaps, such as in the case of electric aviation, may even be a little ahead of the game. The reviewer also stated that this seems to reflect a high degree of progress.

Question 3: Please comment on 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?

Reviewer 1

The reviewer stated that establishing and expanding collaborative partners in the non-road segment, principally in agriculture and construction but also including Aeronomie, will also be important to future decarbonization scenarios.

Reviewer 2

The reviewer noted that the project team appears to have done an excellent job at collaborating and coordinating with tool users and government industry groups.

Reviewer 3

The reviewer asked whether the use and license of these tools should be restricted to U.S. stakeholders.

Reviewer 4

The reviewer commented that presented information does not provide a very deep look into the project team within the laboratory. Collaboration and coordination with users and stakeholders, however, was featured in both the oral and written presentations. The reviewer focused on this specifically because the sophistication in the approach described is worth noting and, given that the team has this capacity, there is some potential not fully realized in this project that could add substantial additional impact and relevance. Attentiveness and responsiveness to the needs of industry stakeholders in tool design and functionality was portrayed as a priority, and convincingly so. Besides several testimonials to that effect, the presenter gave a good description of their approach.

The reviewer added that the project's online presence contains pretty good instructional videos on how to use these tools. The style of engagement with these stakeholders, at least on the surface, seems to represent a form of co-design, which is a sophisticated method that, in theory, would be expected to produce better results and higher use rates. To the extent that these CORE tools are widely used by industry, that is some indication of the success of their stakeholder and analytical expertise. Although it does not presently seem to be part of the project plan, the reviewer wondered about the impact of taking that same approach to municipal governments, as a different kind of stakeholder.

The reviewer suspected that the value of the underlying analytics would transfer seamlessly, but it would likely require differently designed user interfaces, more accessible terminology in the drop-down menus, and maybe some additional scenarios. The tool controls are not user-friendly for non-technical users, but they could be. The reviewer would like to see these tools become more accessible, through co-design, by public entities such as cities, counties and regions. This could provide an easier pathway for planning as well as for aggregating scenario assessment, emission metrics, etc., which is currently a challenge.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer commented that the suite of tools has appropriately focused on on-road transportation modes. However, continuing to expand Aeronomie to allow analysis of mesh-based rather than hub-and-spoke based freight mobility, enabled by short-range aerial modes, possibly based on MEP considerations, may be useful.

Reviewer 2

The reviewer noted that the proposed next steps appear to be a logical and systematic expansion of the ANL tool integration and workflow process and support environment.

Reviewer 3

The reviewer noted that the tools should be maintained as there will always be new questions that if the product became static it would not be able answer.

Reviewer 4

The reviewer commented the there is little doubt that this team can remain current with the kinds of tools they are building and that these tools are valued by current stakeholders. Wondering if there are additional users and stakeholders to be served with these tools, leading to broader impacts of the public investments in them.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer stated that the work on ANL Core Tools is systematically breaking down the individual components of freight and personal mobility to allow assessment of decarbonization strategies, leading to optimization.

Reviewer 2

The reviewer noted that the project supports the EEMS and Analysis subprograms by improving individual ANL analysis and simulation tools and by improving the integration and interoperability of the overall set of tools that are being maintained by ANL.

Reviewer 3

The reviewer stated that the core tools presented are the backbone of the simulation and virtual design space for many energy reducing and carbon dioxide (CO_2) reducing project concepts considered by DOE.

Reviewer 4

The reviewer stated that due to the inclusion of so many different vehicle and fuel types in these tools, they touch virtually every part of the VTO portfolio. It may be worth brainstorming about whether there are additional applications.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer stated that the resources are sufficient for the scope defined. However, if expanding the user base is a key part of the business strategy, then more resources will be needed to support the effort.

Reviewer 2

The reviewer commented that the presentation material indicated that the tool suite can be maintained at current funding levels. Without more specific upgrade needs listed funding appears to be sufficient.

Reviewer 3

The reviewer stated that the resources are sufficient for the scope defined. However, if expanding the user base is a key part of the business strategy, then more resources will be needed to support the effort.

Reviewer 4

The reviewer felt that this hard to review based on available information. It would require a much deeper dive to make this determination. If, however, there would be some consideration to expand attention and design of these tools to more diverse and discrete stakeholders, the reviewer commented that additional resources might be required.

Presentation Number: EEMS037
Presentation Title: Big Data Solutions for Mobility 2.0
Principal Investigator: Jane Macfarlane, Lawrence Berkeley National Laboratory

Presenter

Jane Macfarlane, Lawrence Berkeley National Laboratory

Reviewer Sample Size

A total of four reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

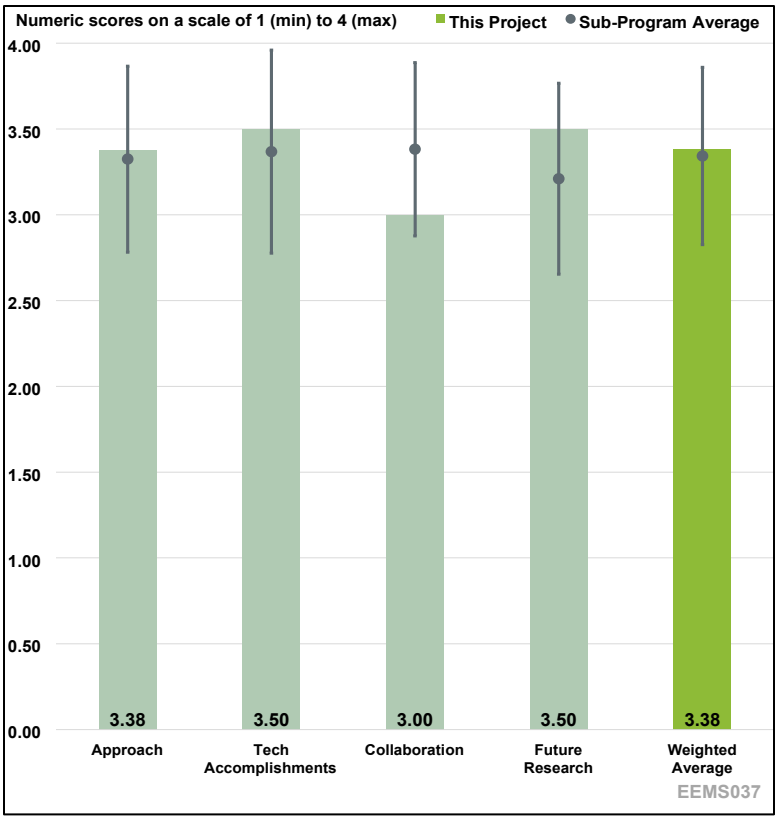

Figure 4-2. Presentation Number: EEMS037 Presentation Title: Big Data Solutions for Mobility 2.0 Principal Investigator: Jane Macfarlane, Lawrence Berkeley National Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer said that the plan sounds reasonable, and it was successfully completed.

Reviewer 2

The reviewer commented that although the project is completed, it would appear that it has met the barriers and challenges which it had hoped to answer.

Reviewer 3

The reviewer noted that the approach presented seems technically sound and covers a multitude of factors to consider for modeling. The use of high performance computing in the cloud allows for quick and cost-effective use of resources.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer stated that it was well done based on the project plan.

Reviewer 2

The reviewer stated that the City of San Jose, California, the primary stakeholder, appears well pleased with the outcome of the project and its ability to run time sensitive transportation studies.

Reviewer 3

The reviewer noted that the results shared are very impressive and show great validity in the project itself. The reviewer stated they were very excited to see the continuation of this research.

Question 3: Please comment on 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?

Reviewer 1

The reviewer felt that the collaboration could have been described more. Though the time was very limited and did not see it as a pitfall of the presenter.

Reviewer 2

The reviewer commented that the partners in the project give a broad perspective and provided what appear to be useful data. There are immediate use cases for the work that has been done. The reviewer would have liked for considerations of how this research could support other areas. An example would be: “can this work be tied to other data sets such as mobile emission sources to support air quality modeling?” There is a lot of potential to this work’s applications, especially given how quickly multiple scenarios can be run. Of course, setting up data for other regions is time consuming and complex.

Reviewer 3

The reviewer felt that the objective for current period included energy estimates for battery electric vehicles. Electric vehicle (EV) original equipment manufacturer (OEM) collaboration and contribution could be a strong value add.

Reviewer 4

The reviewer stated that in this final presentation, there was little discussion about the partners final contributions.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer said that the ongoing research into the areas presented will lend itself to additional discovery of use cases for this project.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer said that the project and its achievements can support the EEMS and Analysis objectives in the VTO programs.

Reviewer 2

The reviewer commented that yes, the project did clearly define a purpose for future work.

Reviewer 3

The reviewer noted that the modeling provided in this project would seem very much in line with the objectives of EEMS.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer noted the project is now completed.

Reviewer 2

The reviewer stated that the project is complete.

Reviewer 3

The reviewer commented that large-scale modeling can often use any and all resources available and it is difficult to discern where resources are flowing but this topic did not raise concerns one way or another from the information presented.

Presentation Number: EEMS041
Presentation Title: ANL Everything-in-the-loop (XIL) Capabilities
Principal Investigator: Kevin Stutenberg, Argonne National Laboratory

Presenter

Kevin Stutenberg, Argonne National Laboratory

Reviewer Sample Size

A total of five reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 80% of reviewers felt that the resources were sufficient, 20% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

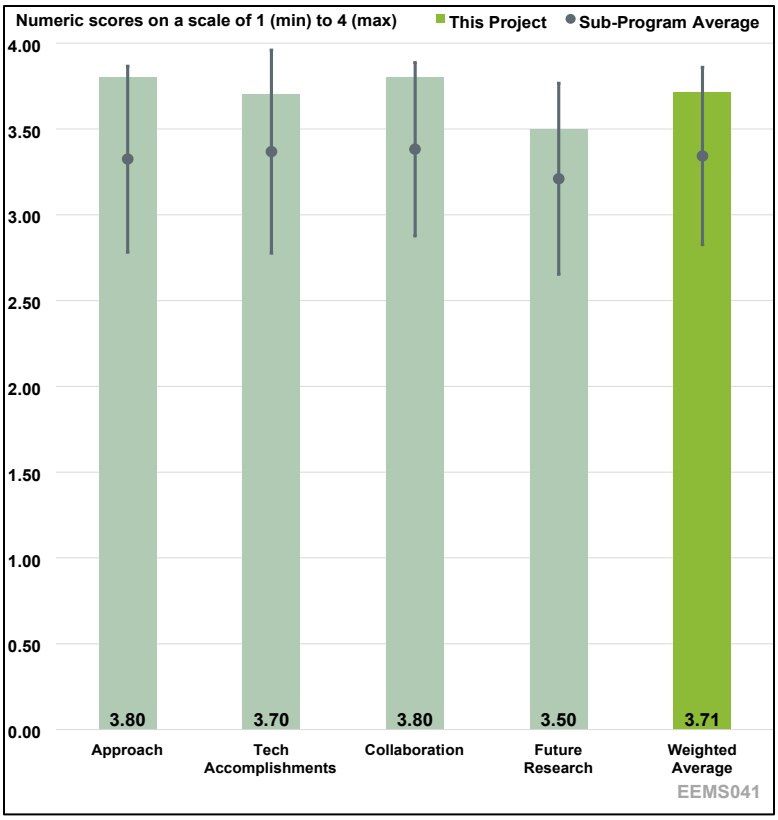

Figure 4-3. Presentation Number: EEMS041 Presentation Title: ANL Everything-in-the-loop (XIL) Capabilities Principal Investigator: Kevin Stutenberg, Argonne National Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer said that the project has developed methods that address the described technical barriers very well. The ability to interface real and virtual vehicles in a test setting is impressive. The real-time tools allow for maximum flexibility in what can be measured.

Reviewer 2

The reviewer noted that the project is addressing barriers including working to include real-world energy impacts.

Reviewer 3

The reviewer stated that the everything in the loop (XIL) project is well-designed and meticulously planned. The developed technical approach is an efficient method for evaluating connectivity and automation. Additionally, the EEMS program barriers have been well addressed.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer noted that the technical progress has been excellent. The tasks are on track or completed. It is nice to see that the team now has some of the latest vehicle technology to work with and the Virtual Open Innovation Collaborative Environment for Safety (VOICES) demo was an impressive use of the methods developed to date.

Reviewer 2

The reviewer said that the presenter has achieved various accomplishments, such as integrating new validated vehicle platforms, streamline, improve and expand XIL workflow including to support EEMS/Systems and Modeling for Accelerated Research in Transportation (SMART) projects. The presenter also demonstrated a successful peer review publication and two conference talks.

Reviewer 3

The reviewer said that it was good to see impact of grade included as this has been noted as an important factor in energy consumption. Working on incorporating impact of lateral movement and uncertainty. Suggest further understanding of uncertainties associated with on-road testing.

Reviewer 4

The reviewer stated that the virtual environment and actual field conditions are well-synchronized. Critical components of the system were integrated. The workflow of XIL simulation is well designed.

Question 3: Please comment on 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?

Reviewer 1

The reviewer commented that the project tasks support and are spread across various programs and a significant number of researchers. The collaboration amongst these folks appears to be smooth and is achieving the desired results.

Reviewer 2

The reviewer commented that the proposer has described successful collaboration with other national laboratories Oak Ridge National Laboratory (ORNL) and Lawrence Berkeley National Laboratory (LBNL), U.S. Department of Transportation (DOT), Illinois Institute of Technology, and University of California, Irvine (UCI). One example is the Department of Transportation (DOT)/VOICES review and collaboration Pilot 2 program.

Reviewer 3

The reviewer said that this project collaborated with DOT's VOICES project to advance distributed testing.

Reviewer 4

The reviewer stated that there is excellent collaboration all around.

Reviewer 5

The reviewer said the vehicle OEM and or a dynamometer test organization collaboration and partnership could further benefit the project.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer said that the proposed work continues and extends the capabilities already developed. These are reasonable next steps.

Reviewer 2

The reviewer stated that the proposed future research is solid.

Reviewer 3

The reviewer commented that the proposed future work is relevant. This reviewer questions the proposed necessity of acquiring new vehicle models without explanation of the new technology being deployed.

Reviewer 4

The reviewer stated that the aerodynamic load emulation is likely overly optimistic in energy reductions. Impact of cross flow, adjacent vehicles all have a negative impact.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer commented that the project methods allow assessment of vehicle technologies in a mobility system environment, allowing the study of vehicle to everything (V2X) implications.

Reviewer 2

The reviewer stated that yes, the overall project is able to demonstrate ANL anything in the loop's XIL workflow with aero load emulation, integration of uncertainty analysis for energy characterization, safety implementation and real time distributed XIL architecture update.

Reviewer 3

The reviewer stated that the project is closely tied to the EEMS objectives and workflow.

Reviewer 4

The reviewer stated that yes, this project meets the VTO EEMS and Analysis objectives.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer noted that the resources appear sufficient. The team has been able to achieve success in addressing vehicle testing barriers with the funding provided.

Reviewer 2

The reviewer commented that yes, the allocated resource is sufficient.

Reviewer 3

The reviewer stated that the resources are appropriate for the project.

Reviewer 4

The reviewer commented that the presenter highlights the difficulty of acquiring new research vehicles through General Services Administration (GSA), which has resulted in long lead times (more than 12 months) for desired advance technology vehicles that are new or uncommon in the

current market. VTO needs to take note of this inconvenience and coordinate with GSA to reduce the long lead time from 12 months to three months.

Presentation Number: EEMS066
Presentation Title: Livewire Data Platform-A Solution for Energy Efficient Mobility Systems (EEMS) Data Sharing
Principal Investigator: Lauren Spath-Luhring, National Renewable Energy Laboratory

Presenter

Lauren Spath-Luhring, National Renewable Energy Laboratory

Reviewer Sample Size

A total of five reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

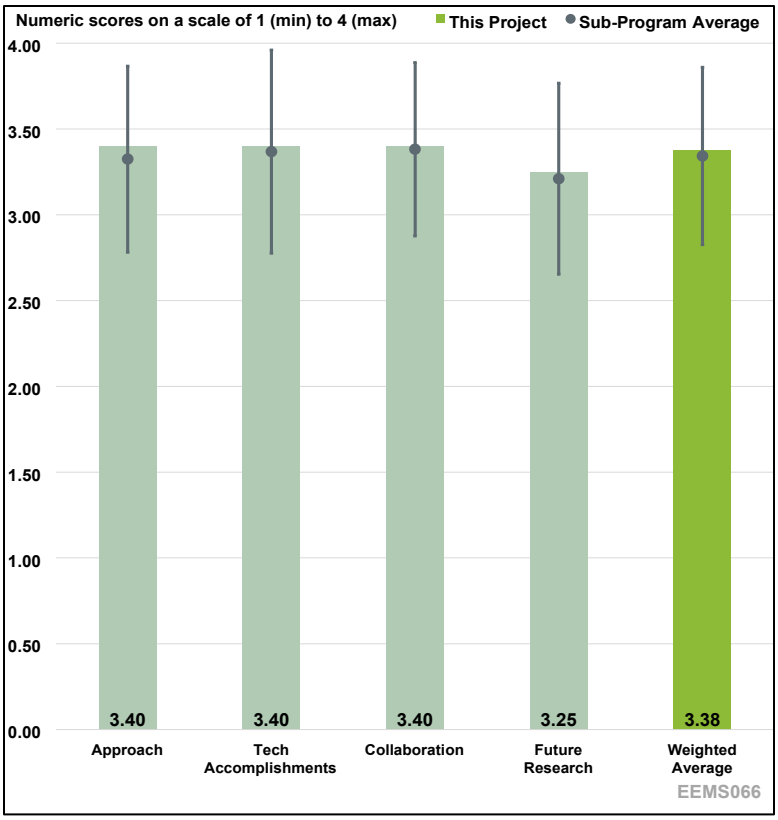

Figure 4-4. Presentation Number: EEMS066 Presentation Title: Livewire Data Platform-A Solution for Energy Efficient Mobility Systems (EEMS) Data Sharing Principal Investigator: Lauren Spath-Luhring, National Renewable Energy Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer said that the work was performed well, and technical barriers are adequately addressed.

Reviewer 2

The reviewer commented the Livewire data platform is a collaboration among Pacific Northwest National Laboratory (PNNL), National Renewable Energy Laboratory (NREL), and Idaho National Laboratory (INL) to make EEMS data open and easily accessible. The project team worked to address technical and cultural challenges with the data and provide three levels of data access. The project was a large undertaking, and the 392 datasets are only as of March 2024.

Reviewer 3

The reviewer said that the project, and associated tool effectively addressed many of the technical barriers. The tool offered cross-federation of datasets with data.transportation.gov, it provided varying levels of access based on user needs.

Reviewer 4

The reviewer stated that the purpose of Livewire is to help advance research on new mobility technologies by bringing data on those technologies together onto one secure, organized, well-managed platform. The platform should be used to share findings and enable collaboration to expedite and improve knowledge generation.

Reviewer 5

The reviewer noted that concerning barriers, e.g., expansive community of relevant stakeholders and difficulty in sourcing empirical real-world data applicable to new mobility technologies such as connectivity and automation, the project is addressing both, but quantitative assessment of users and potential users would be beneficial.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer commented that the technical progress is good.

Reviewer 2

The reviewer commented that the Livewire team has made great progress on getting several hundred datasets onto the platform, with a focus on reference document management and “low-level” metadata. There is cross-federation between Livewire and data.transportation.gov, which is an important connection that increases access and visibility for DOE and DOT stakeholders.

Reviewer 3

For reviewer commented that the technical accomplishments and progress, key metrics would be helpful to present in the main deck it notes: Saw an increase in usage metrics in FY 2023 quarter one. There is a back-up slide which is helpful but additional assessment of current and potential users would be very helpful.

Reviewer 4

The reviewer said that the project has made expected progress compared to the project plan.

Reviewer 5

The reviewer stated that the platform provides free data storage, quality characterization, data discovery, and multiple upload and download methods. It provides user support and has a forum for user feedback. A significant accomplishment in the previous year has been the use of generative AI along with detailed metadata to provide a chatbot feature for users. The team has recently also focused on outreach to increase contributors and users, presenting on the platform at numerous conferences. It appears that the team is constantly improving this platform and increasing the number of contributors and users, thus enhancing its value.

Question 3: Please comment on 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?

Reviewer 1

The reviewer commented that the collaboration across teams is good.

Reviewer 2
The reviewer stated that this project involved collaboration across three national laboratories and many data owners and data managers at DOE, as well as the DOT data program. No additional collaboration needs were noted.

Reviewer 3
The reviewer commented that the project relies on collaboration of contributors and users. Noting and assessing feedback from both groups would be beneficial.

Reviewer 4
The reviewer noted that there were positive and significant collaborations within the project team, including from PNNL, INL and from mobility researchers at large. NREL built and managed the application program interface. PNNL provided built the underlying platform and provides quality assurance (QA)/quality control for ongoing development.

Reviewer 5
The reviewer commented that the project relies on collaboration. The platform is run by 3 national laboratories and contains data from more than 60 organizations. The latter, especially, requires an impressive amount of communication, coordination, and trust-building among a large, diverse group of researchers. They are also expanding the value of the platform by opening up its data to other similar catalogs, like the DOT data catalog. More can be done to get data from state energy offices and receive and incorporate feedback from data working group.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1
The reviewer noted that the project is complete and well done.

Reviewer 2
The reviewer said that the project has clearly defined future work streams and a path to achieve those goals. Future work includes identifying and incorporating other datasets, providing better data quality characterization, increasing analysis capabilities, and using generative AI to establish chatbot support.

Reviewer 3
The reviewer stated that there are plans to get more datasets onto Livewire. It would be helpful to better understand the end uses and potential analysis capabilities on the platform.

Reviewer 4
The reviewer stated that using user feedback in assessing needs for future development would be helpful.

Reviewer 5
The reviewer commented that some future work is clearly vital to the success of the platform, e.g., adding GSA and U.S. Environmental Protection Agency data. However, it is unclear what the value of the interactive data map is. Similarly, it is unclear what additional progress the team plans to make on generative AI methods.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer said that this project facilitates access to diverse sets of use case data and is a good resource for the EV research community.

Reviewer 2

The reviewer commented that Livewire includes a range of transportation and EEMS datasets. The project supports multiple VTO objectives.

Reviewer 3

A reviewer said that a data sharing tool like this is very valuable to the community.

Reviewer 4

The reviewer commented that the project provides useful support to public and private mobility researchers to enable discovery and storage of transportation data.

Reviewer 5

Data sharing and effective data management across research teams is vital for effective knowledge generation on advanced vehicle technologies.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer commented that the resources were adequate.

Reviewer 2

Reviewer stated that there were no concerns noted regarding resource availability.

Reviewer 3

The reviewer said that the resources are sufficient to achieve the milestones within the remaining project timeframe.

Reviewer 4

The reviewer commented that the platform seems to be fully functional, as envisioned, and even incorporating advanced search, download, and upload functions to improve user-experience. The biggest challenge is finding and convincing relevant researchers to provide the necessary data and make use of the available data.

Presentation Number: EEMS090
Presentation Title: Applying Artificial Intelligence (AI) Based Signal Coordination and Controls for Optimized Mobility for the Nimitz Highway
Principal Investigator: Hong Wang, Oak Ridge National Laboratory

Presenter

Hong Wang, Oak Ridge National Laboratory

Reviewer Sample Size

A total of four reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

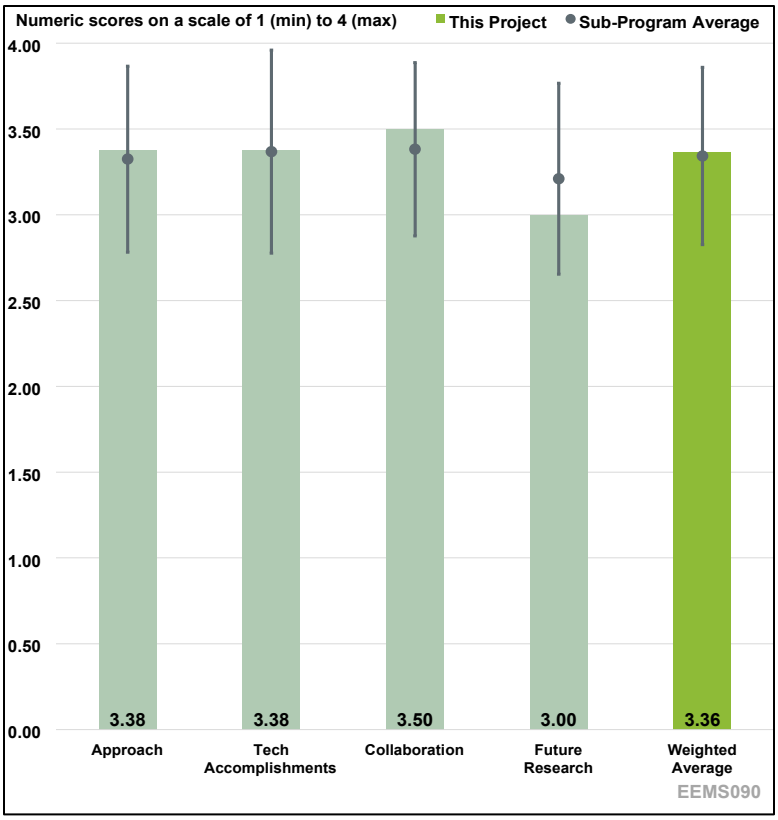

Figure 4-5. Presentation Number: EEMS090 Presentation Title: Applying Artificial Intelligence (AI) Based Signal Coordination and Controls for Optimized Mobility for the Nimitz Highway Principal Investigator: Hong Wang, Oak Ridge National Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer said there was a good plan and that the barriers are addressed.

Reviewer 2

The reviewer noted that given that the project is 100% complete there is basis to judge the timeline. Given that, according to the presentation, the system has been deployed in the field and has been working during the last three months with no issue the reviewer calls it a success.

Reviewer 3

The reviewer stated that the researchers proposed and executed a well-designed project to address the technical barriers listed. Most notably, their contribution to advancing a use of a neural network and real-time AI control implementation on an arterial road is a significant accomplishment to our understanding of the potential for use of these technologies to optimize mobility in high-traffic conditions.

Reviewer 4

The reviewer commented that this seemed like a project that was created to get data, but did not have a focus on deliverables for the work.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer said that all the milestones were achieved.

Reviewer 2

The reviewer commented that all project tasks have been completed. There is a report of some delays in the project implementation but given that all work has completed successfully all issues have been resolved.

Reviewer 3

The reviewer stated that the researchers have completed the work and made important technical contributions in both developing the neural network and executing real-time application of AI, with data and analysis on results under different conditions and time-periods. There was limited focus on the energy elements of the technology use. Though the project is completed, it would be useful if any future research could do more assessment of the energy and emissions implications of the use of the AI system. For example, the researchers note energy savings demonstrated so far at 9% but there are many research questions that could delve further into this context, such as variations in energy savings under different conditions, improvement to how energy efficiency is estimated, and how this compares to energy use involved in use of the AI in real-time.

Reviewer 4

The reviewer was unclear as to the accomplishments. The reviewer appreciated the 8-10% productivity gains, but the presenter did not explain, even after a question or two by the reviewers how this was actually measured, giving me concerns over validation.

Question 3: Please comment on 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?

Reviewer 1

The reviewer believed that the collaboration details could have been described further, although, presentation time was limited in general.

Reviewer 2

The reviewer said that project team collaboration seems ok.

Reviewer 3

The reviewer stated that the presentation gave the impression that the collaboration between ORNL and University of Hawaii at Manoa was smooth and fruitful. More importantly, the reviewer saw the adoption of the system by Hawaii DOT, as well as the seamless collaboration with Econolite, one of the biggest suppliers of traffic control systems in the country, as a great success.

Reviewer 4

The reviewer noted that the researchers worked successfully with a cross-institution team. Most notably, it is helpful to see the integration of state DOT officials and private sector involvement. This collaboration and coordination undoubtedly led to successful completion of the project and the

reviewer hoped that the collaboration also paves the way for continued implementation of the technologies, even though the research project as concluded. It is great to see that patent applications have been filed and steps towards commercialization are being taken.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer commented that the presentation documents did not describe any future research beyond this completed project. There is a mention of a patent application, and it was verbally discussed that the industrial partner Econolite has expressed interest in adopting the system.

Reviewer 2

The reviewer noted that the project is at 100%. The PI requested carry on projects, but the reviewer would be reluctant.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer identified the project as related to EEMS and Analysis.

Reviewer 2

The reviewer stated this was a very interesting and realistic project and that the use of new technologies like AI and machine learning (ML) was practical and it allowed for the development of an actual, immediately feasible traffic control system that showed benefits as soon as it was implemented.

Reviewer 3

The reviewer commented that the project is relevant and responsive to the objectives of the EEMS Program; however, future projects in this area could benefit from additional and more expansive scope and analysis directly connected to the energy and emissions impacts of technology applications. Here it is understandable that the focus was on development of the algorithm and real-time application of it, given the novelty of these technologies. It would be great for future work to shed additional light on the potential this work to improve energy efficiency of transportation networks.

Reviewer 4

The reviewer said that the project is relevant in that traffic management and is a great solution to work on but was unclear as to the success of this project.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer commented that the resources were sufficient, and the project is complete.

Reviewer 2

The reviewer was unsure.

Reviewer 3

The reviewer said that that given that the effort involved deployment in the real world, the reviewer believed the budget was reasonable.

Reviewer 4

The reviewer stated that the researchers did an impressive amount of work on a $2 million budget.

Presentation Number: EEMS092
Presentation Title: BEAM CORE
Principal Investigator: Anna Spurlock, Lawrence Berkeley National Laboratory

Presenter

Anna Spurlock, Lawrence Berkley National Laboratory

Reviewer Sample Size

A total of five reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

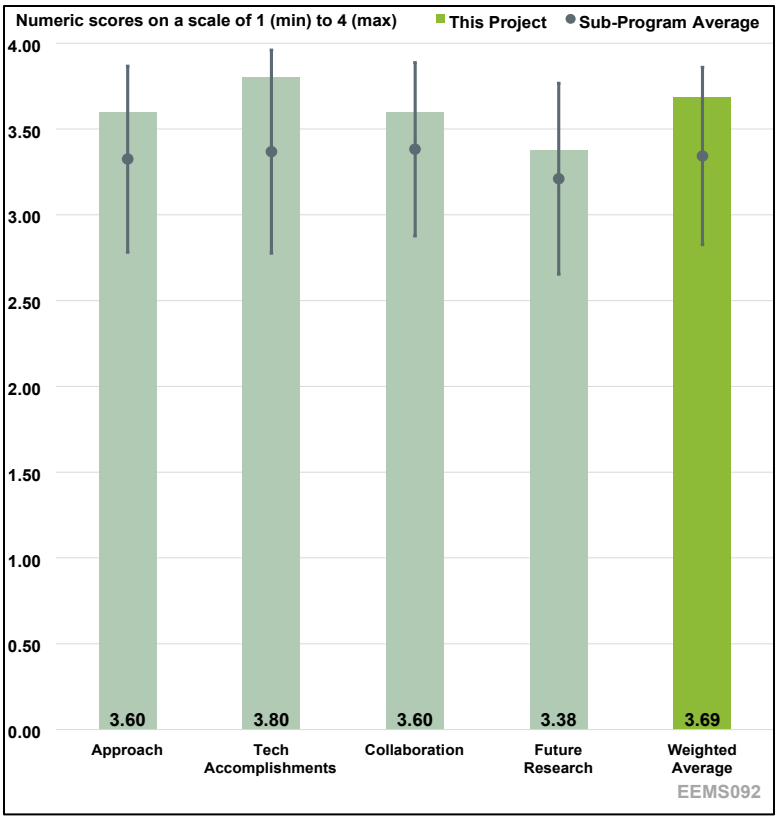

Figure 4-6. Presentation Number: EEMS092 Presentation Title: BEAM CORE Principal Investigator: Anna Spurlock, Lawrence Berkeley National Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer said that particularly given the scale, variety of project partners, and tools used and developed, all was well-coordinated. Starting with substantial stakeholder engagement with 20+ listening sessions guided work and was in good agreement with initial plans. Continued dissemination of work to stakeholders ensured continued alignment. Modular tools that are mixed/matched and swapped made a flexible tool to study a variety of scenarios.

Reviewer 2

The reviewer stated that Behavior, Energy, Autonomy, and Mobility Comprehensive Regional Evaluator (BEAM CORE) is an impressive package of integrated software tools and methods attempting to answer very difficult questions. It does an impressive job of capturing the details of the moving parts of a very complex system of systems (SoS). The team has been able to do some impressive what-if studies that can be utilized by city and transport system planners.

Reviewer 3

The reviewer commented that this project involves agent-based and behavioral modelling related to passenger and freight mode choice. The BEAM CORE approach includes various technology adoption considerations and “what if” mode choice scenarios. The project appears to be very well

designed and managed, especially given the complexity and number of modules and case studies that have been completed. No concerns noted regarding the methodology or timeline.

Reviewer 4

The review said that the approach was excellent on all aspects except for vehicles. The team did not have a subject matter expert on EV deployment, maintenance and predictive component replacement. The approach of working with stakeholders to provide insights on feasible actions they may take to improve mobility, energy, environmental and equity outcomes in their regions is solid and relevant.

Reviewer 5

The reviewer commented that three-year timeline is reasonable. Comprehensive due to its use of multiple tools specializing in a different segment of the transit system.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer noted that there was a substantial tool development with several new modules developed to expand the initial model, including stakeholder input (e.g., freight). Several interesting and timely scenarios were developed and analyzed, including telecommuting, ride-hailing, and congestion pricing.

Reviewer 2

The reviewer said that the technical progress has been outstanding. All tasks have been completed, on time. The original BEAM tool has been greatly extended in capability.

Reviewer 3

The reviewer commented that the presentation included overviews of the Automobile and Technology Lifecycle-Based Assignment (ATLAS) and Freight Activity Mobility Simulator (FAMOS) modules and several case studies, including the Austin Freight medium-duty (MD)/heavy-duty (HD) and San Francisco Bay teleworking scenario. Future considerations include ZEV freight and more detailed evaluations of air quality and health impacts as a result of implementing a scenario. Validation has been conducted on the baseline so far. It would be interesting to see additional verification and validation of the scenario outputs, including the telework and pricing programs.

Reviewer 4

The reviewer noted that the workflow established and implemented to process and transform scenario outputs for users to interact with model results in web-based data visualization dashboard. Scenario comparison feature supports understanding the direction and magnitude of change across scenarios. Continuing to integrate equity focused sociodemographic variables to enable nuanced filtering of travel by individual and household features such as race, age, income, gender, vehicle availability and employment.

Reviewer 5

The reviewer commented that the technical approach was excellent and did overcome most barriers. The lack of having a commercial transportation stakeholder on the team or as advisors leaves a gap in the true technical requirements.

Question 3: Please comment on 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?

Reviewer 1

The reviewer said that the large number of collaborators spread out across the country, dealing with integrating their portions of the software project, requires very good communication and collaboration. The national laboratories, particularly NREL have provided outstanding contributions to the project.

Reviewer 2

The reviewer commented that the project team has conducted extensive outreach as part of BEAM CORE development and for specific case studies, including coordination with San Franciso Bay Area agencies and community groups and MD/HD stakeholders in Austin. The project is led by LBNL with contributions from other national laboratories and federal and state agencies, such as the California Air Resources Board (CARB). The team may consider future collaboration with these same groups to validate scenario outputs with real-world outcomes.

Reviewer 3

The reviewer said that this a very good team was assembled, the lack of a professional commercial transportation stakeholder leaves a significant gap. The academia, government and laboratory partners are all very good.

Reviewer 4

The reviewer said that the variety of national laboratories and two mobility simulation technology companies, and one university are part of the team. Particularly tight teamwork with NREL, even working on the same modules together. Only negative is that some additional end user engagement would support development and ensure end product(s) is(are) in alignment with up-to-date needs.

Reviewer 5

The reviewer noted that the project did well bringing various laboratories together based on their differing expertise. Appreciate the listening sessions completed, to incorporate stakeholder feedback throughout the project. Recommend further engagement with private sector for feedback, demonstrations, and pilots.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer stated that working with metropolitan planning organizations to do additional studies, and also discussion options with other agencies. Current topics such as vehicle to grid are proposed and would support EEMS goals. Additional focus on freight and addition of air quality and health impact for environmental justice impacts are positive. It would be good to have more details on the plan to get the open-source model/modules used by others, especially considering how complex the full model is.

Reviewer 2

The reviewer commented that the additional capabilities planned are logical follow-ups to the current work. The emissions modeling work sounds intriguing.

Reviewer 3

The reviewer said that yes, the project clearly defined future work and goals. The project team plans to follow up with stakeholders and conduct data updates. BEAM CORE development will continue with additional modules or updates to existing modules.

Reviewer 4

The reviewer noted that the future research is relevant to develop emission modeling that couples with simulated traffic activities and emission factors. Quantify the air quality and health impacts from the spatially resolved emission changes.

Reviewer 5

The reviewer suggested that instead of continuing to add new tools, the project focus should be on piloting existing tool, like with CARB, Metropolitan Transit Commission and the Puget Sound Regional Council.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer described the project as highly flexible and adaptive tool was used to study currently relevant scenarios and additions to the model were developed to do so. All aspects meet EEMS goals on mobility, accessibility, efficiency, and community engagement.

Reviewer 2

The reviewer commented that this project ties all of the EEMS pillars together to allow long-term what-if assessments of mobility system impacts. It can provide useful insights as to possible impacts of EEMS programs.

Reviewer 3

The reviewer stated that the project supports several VTO objectives, including EEMS, Electrification, and advanced technologies. The modeling and scenario analysis approach includes many modes and technologies (micromobility, zero emission vehicles EV, etc.).

Reviewer 4

The reviewer commented that this research must be completed to fully understand the impacts of EV adoption. Establish incentives and dedicated spaces to increase commercial EV adoption and safe and compliant curb behavior. This project develops a roadmap to support cities with policy structure, curb user data and identify improved management opportunities.

Reviewer 5

The reviewer said the project is mostly relevant to EEMS, Electrification, and Analysis.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer said that it is a highly capable and diverse team. National laboratories, companies, and universities involved have the needed expertise and tools.

Reviewer 2

The reviewer noted that the project was completed successfully with resources provided. The presenter did not mention any missed opportunities due to lack of resources.

Reviewer 3

The reviewers stated that the project resources appear to be sufficient. No concerns noted about funding levels. The part of the project in the presentation is considered complete. The reviewer did not comment on availability of future funding.

Reviewer 4

The reviewer noted that the project had many resources with great contributions. The stakeholders need to include strong business acumen. The current resources do not include this acumen, laboratories and government agencies do not provide this accurate data input.

Presentation Number: EEMS093
Presentation Title: Transportation System Impact POLARIS Workflow Development Implementation and Deployment
Principal Investigator: Joshua Auld, Argonne National Laboratory

Presenter

Joshua Auld, Argonne National Laboratory

Reviewer Sample Size

A total of five reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

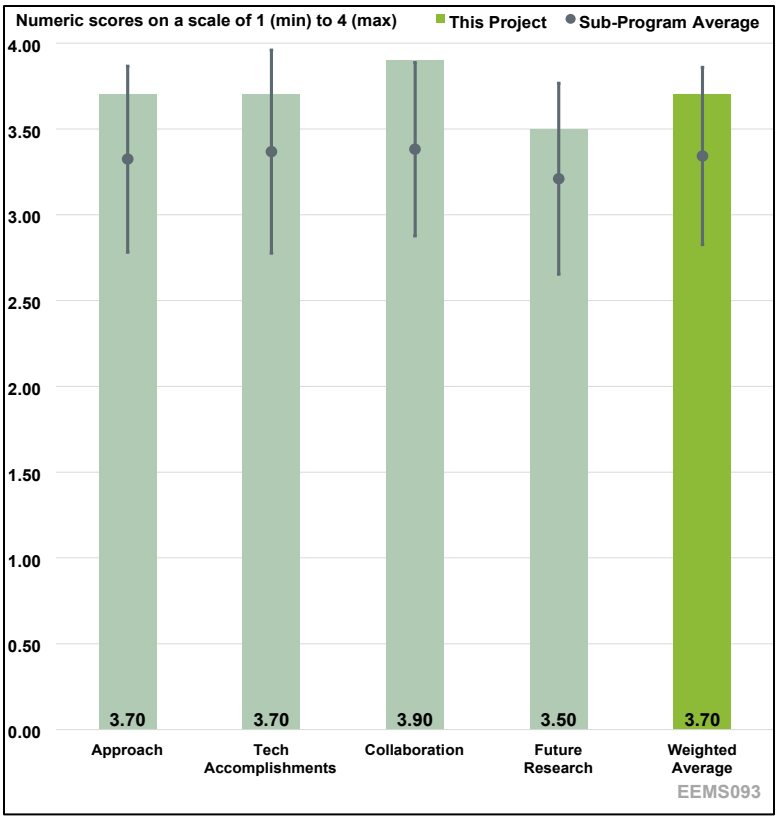

Figure 4-7. Presentation Number: EEMS093 Presentation Title: Transportation System Impact POLARIS Workflow Development Implementation and Deployment Principal Investigator: Joshua Auld, Argonne National Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer said that POLARIS's capability has been significantly enhanced over the life of the project. New capabilities are effectively addressing the questions posed by EEMS. The project is effective in addressing various uncertainties associated with the EEMS-related technology and policy options.

Reviewer 2

The reviewer stated that the approach for this project was very extensive and tackled everything from new feature development to incorporation of new studies and data sets and stakeholder engagement. This was extremely thorough and far-reaching.

Reviewer 3

The reviewer commented that POLARIS is an advanced freight and passenger travel demand model that can help evaluate goods and people movement in a transportation system. Recent work has focused on validation and calibration and increasing the scope and scale of studies, including a large 192-scenario study in Chicago. The project seems to be well designed and managed and cover a very wide range of strategies and stakeholders. Discussion around the stickiness of auto mode and

impacts to disadvantaged communities was particularly interesting and addresses some of the barriers facing local communities and decision makers.

Reviewer 4

The reviewer noted that the project approach is very clear, and the project team was able to accomplish a lot in the roughly three-year timeline. The project team worked through a number of technical barriers, including developing workflow automation capabilities and increased accessibility for end-users through development of desktop and cloud-based processing. It seems that the capabilities of POLARIS to evaluate the impact of changes to transportation system technologies and policies have come a long way, but that there is still a significant opportunity to improve and increase functionality of the model. Throughout this project timeline, the team added many interesting and relevant features to the model and identified several others that can be added in the future to enhance the tool. It seems the project made great strides in addressing gaps in the POLARIS workflow. All milestones for the project have been met, and the project has been completed.

Reviewer 5

The reviewer's perception of this presentation was predominately focused on results, not methodology. However, the reviewer was impressed with the way the project team coordinated the Chicago study. Part of what makes transportation so challenging is that there are too many "cooks in the kitchen" so to speak (i.e., there are so many agencies that have jurisdiction over a small part of the network). The reviewer hopes that the project team is going to document all of its challenges and lessons learned in coordinating Chicago Department of Transportation, Chicago Metropolitan Agency for Planning, Chicago Transit Agency, and the Regional Transportation Authority. The reviewer is interested in how the project are documenting how they came to consensus across different priorities to identify a path forward as part of this process. The reviewer thought that the consensus piece (or getting everyone steering the ship in the same direction) is one of the biggest challenges we face. The reviewer was really excited to see the different deployment paths that you are exploring (e.g., the working directly with agencies, cultivating agency/university connections, and the hands-on support from ANL like with the Chicago example) – The reviewer hoped the project team will keep exploring these opportunities to get POLARIS into the right hands.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer commented that the project has achieved its technical objectives and has been effectively deployed to help address policy questions posed by local governments, with study results which will provide input for their planning.

Reviewer 2

The reviewer commented that the technical accomplishments of this project were extremely far reaching and impressive. The vast expansion of capabilities of this model will enable so many new and different studies.

Reviewer 3

The reviewer noted that the project team has pulled together an impressive case study on Chicago area transportation. As part of this case study, they coordinated with stakeholders (Chicago Metropolitan Agency for Planning, Chicago DOT, and transit authorities) and considered strategies and systems such as congestion pricing, off hours delivery, connected traffic signals, and shared

scooters. By pulling various levels, the team used POLARIS to demonstrate increased efficiency even though without a decrease in vehicle miles traveled or vehicle hours traveled.

Reviewer 4

The reviewer said that the team does seem to have been successful at addressing gaps to the POLARIS workflow, and made significant technical progress in developing the tool, by automating the workflow, adding functionality on different platforms, increasing the scope and scale of studies over the course of the project, and adding many new features to the tool. There does seem to be an opportunity to expand on the project even more, continuing to refine the workflow, expand functionality and accessibility for end-users, refine and add features, and run additional studies. The reviewer found it interesting that the transit levers did not result in MEP improvements—the reviewer expected transit improvements to also improve mobility metrics. This makes me wonder, are the transit levers (speed and frequency) sufficient? Should there have been additional levers, such as increased routes, easier payment systems, enhanced multi-modal connection?

Reviewer 5

The reviewer noted that according to Slide 8, all milestones on the project plan were met prior to the completion of the project. (CONGRATS!)

Question 3: Please comment on 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?

Reviewer 1

The reviewer said that the project has a large team of contributors that need to collaborate effectively to achieve the project goals. The national laboratory, academic and industry partners are working well together.

Reviewer 2

The reviewer commented that the collaboration between teams, participants, and stakeholders is at another level for this project due to its sheer scope and size. Only suggestion is to continue finding ways to provide resources for additional users and agencies to make use of.

Reviewer 3

The reviewer noted that the project team includes software development (open-source studio tool, etc.) and stakeholder outreach with local agencies, vendors, and community groups. No additional collaborate needs noted.

Reviewer 4

The reviewer commented that the coordination among partners appears to have been strong throughout the project period. Stakeholder engagement informed features to include, and coordination with partners in the Chicago area for the main study seemed to have been strong. Coordination activities with partners was woven throughout presentation and workplan.

Reviewer 5

The reviewer was really excited to see the work the project put in to build connections with metropolitan planning organizations and look for opportunities to bring them to the table. The more we can understand where the planning workforce is (from a technical perspective) and how we meet them where they are (e.g., Slide 29), the more POLARIS will be utilized. Great work!

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer stated that the proposed future work includes enabling wider deployment of Polaris to encourage greater use by interested parties. Additional features proposed are logical follow ups to the existing work.

Reviewer 2

The reviewer commented that future research proposed looks excellent, the reviewer was excited about the efforts to make this tool set available and accessible to additional stakeholders for their own purposes.

Reviewer 3

The reviewer said that the project team will continue stakeholder engagement to set priorities and accelerate deployment of POLARIS. There was also mention of incorporating new regulations and technologies (e.g., cooperative adaptive cruise control (ACC) case studies).

Reviewer 4

The reviewer commented that the presentation clearly outlined remaining challenges and barriers, along with a proposed future research plan to build on this project and expand the capabilities and relevance of the POLARIS model on measuring impact of transportation system changes. The findings from this project demonstrate the potential for future impact - they were very interesting and showed a lot of promise to be relevant for a variety of organizations and use-cases. The reviewer wondered about the potential to study the impact of a major increase in transit ridership on the various energy, mobility, and efficiency metrics. Additionally, the reviewer was curious what barriers might exist for integrating new mobility modes and options, such as microtransit, dockless shared micromobility, and multimodal travel.

Reviewer 5

The reviewer was a little confused because according to Slide 2, this project is complete as of January 2024, however, Slide 32 provides future research. There is carryover provided on slide 2, but it was not clear to the reviewer what the carryover was being used for. The reviewer thought the presenter said that future research is tied to a different project (EEMS122), so for the purposes of reviewing EEMS093, the reviewer scored this question as not applicable, as the project is complete.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer commented that the software developed in the project is a critical component in measuring the benefits of EEMS policies and technologies which are not yet in place. The tool provides insights into the potential impacts of the EEMS program over time.

Reviewer 2

The reviewer stated that the work conducted under this project is certainly in line with the mission under EEMS.

Reviewer 3

The reviewer stated that the project supports several VTO objectives, including advanced technologies, Electrification, and EEMS. For example, the case study for Chicago included a scooter share component and consideration of connected vehicles and connected signals.

Reviewer 4

The reviewer commented that the project is highly relevant to the objectives of the EEMS Program. The POLARIS tool enables the quantification of the impact of changes to the transportation system on mobility, energy, and efficiency.

Reviewer 5

The reviewer stated that the EEMS Program envisions an affordable, efficient, safe, and accessible transportation future in which mobility is decoupled from energy consumption. However, before different technologies and strategies can be deployed in the real world, they must be evaluated using modeling techniques. This project creates a robust modeling tool that is capable of quantifying the impact of new mobility trends requires to better understand how these technologies will influence vehicle usage, energy consumption and cost.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer noted that the project objectives were achieved with the funding available. There is no indication of missed goals/opportunities due to a lack of funding.

Reviewer 2

The reviewer commented that the POLARIS research seems to be sufficiently funded. More funding would still likely lead to worthwhile additional results.

Reviewer 3

The reviewer had no concerns noted related to resource availability.

Reviewer 4

The reviewer said that the project team was able to complete their project and all milestones within the timeline with the provided resources, with little funding leftover.

Reviewer 5

The reviewer said that the project was able to achieve its objectives with the financial resources made available; the reviewer saw this as sufficient.

Presentation Number: EEMS094
Presentation Title: Development and Validation of Intelligent CAV Controls for Energy-Efficiency and ENACTED
Principal Investigator: Dominik Karbowski, Argonne National Laboratory

Presenter

Dominik Karbowski, Argonne National Laboratory

Reviewer Sample Size

A total of four reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

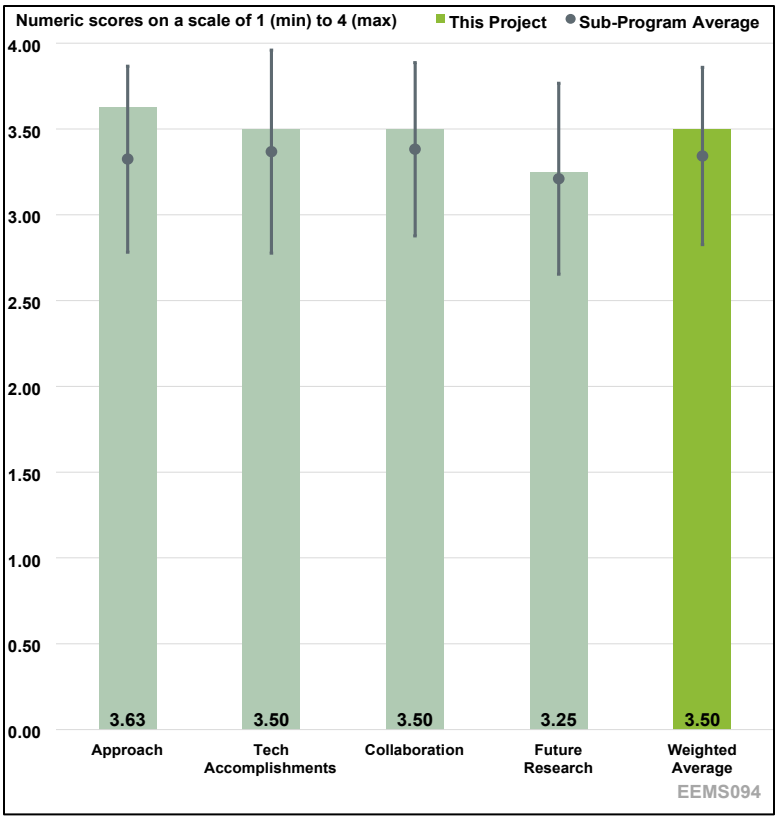

Figure 4-8. Presentation Number: EEMS094 Presentation Title: Development and Validation of Intelligent CAV Controls for Energy-Efficiency and ENACTED Principal Investigator: Dominik Karbowski, Argonne National Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer said that the approach of using real world data and planning to conduct real world model calibration and validation will make it more realistic. The distribution of customers is varied and depending on vehicle class is a major variable as well.

Reviewer 2

The reviewer stated that in characterizing the importance of the ACC work, a fuel consumption penalty for ACC is described. The penalty is based on data from one manufacturer (General Motors), so it is not clear if this is manufacturer specific or more general. Also, it was not clear what the error bars on Slide 9 represented, but it is also possible that there is no statistically significant difference for ACC engagement vs. disengagement. The reviewer recommend that the researchers look at a data from multiple vehicle manufacturers and multiple vehicle types.

Reviewer 3

The reviewer commented that the overall approach to the project is well designed to address the barriers identified.

The reviewer made suggestions on potential additions to the methodology for traffic simulation approach that could be useful, including the use of representative trip data from the OEM trip data set.

The reviewer noted that a key feature the work is capturing is vehicle interactions through automation/connectivity, however the dataset does not appear to include driving behavior simulation calibrated against real world leader/follower pairs.

The reviewer believed that the captive fleet source of data is unlikely to have many clear instances where one vehicle is following another. The “dummy” preceding/leader vehicle behavior will directly impact the behavior of the human driven or automated vehicle. The reviewer does not anticipate that this suggestion would significantly change the conclusions of the project but rather just an additional element of robustness on which to develop and validate the energy saving approaches.

The reviewer added that the use of the next generation simulation data (highway domain) to represent realistic traffic flow in a signalized corridor is understandable given available data but would be a spot that could further enhance the work in the future. Capturing realistic traffic volumes is okay, but validating against real-world dynamics would be desirable.

Reviewer 4

The reviewer said that the presenter did a good job of explaining the importance of this project. The reviewer liked the approach of moving from real-world data to simulation to XIL to real-world deployment (side 5, 34). The reviewer appreciated the team’s approach to making sure their simulations are well calibrated before applying the model in simulation and XIL. The reviewer was very excited to see the team building off of Federal Highway Administration (FHWA) projects, such as those with the University of Wisconsin (UW) and University of Illinois Urbana-Champaign (UIUC). The reviewer does not have any concerns with the approach used by the project.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer said that integrating EV vehicle into the program and expanding the scope is a complex process. Methodology development is very different, and the team has been able to adapt.

Reviewer 2

The reviewer stated that the project appears to be on track.

Reviewer 3

The reviewer commented that the overall progress is commendable, and they do not have significant concerns.

Reviewer 4

The reviewer commented that the SMART Mobility Consortium 2.0 portion of the project appears to be on-track for completion by its targeted date. The ENACTED project is just getting started, so there is not enough information available to pass judgement.

Question 3: Please comment on 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?

Reviewer 1

The reviewer commented that the team has been able to coordinate very well with industry, academia and other national laboratory partners. Having an industry partner provides direct input into the project.

Reviewer 2

The reviewer believes it would be helpful to engage with more than one vehicle manufacturer. If that is not possible, the reviewer recommends engagement with large corporate or institutional vehicle fleets that may have vehicle telemetry data (GSA, state governments, rental car companies, and other companies with large, late model passenger car fleets).

Reviewer 3

The reviewer commented that the project includes eight partners including U.S. DOE laboratories, universities, industry, and city department of transportations. Each members role and contributions are clearly defined and relevant to the stated project goals. The level of collaboration is high but seems to be well organized which is not always easy.

Reviewer 4

The reviewer stated that this is a diverse team that is well coordinated by ANL. The reviewer was very excited to see General Motors (GM) with such an active role on this project. It is hard to get OEMs to come to the table.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer said that Collaboration with ORNL to provide lateral control inputs using the dyno.

Reviewer 2

The reviewer stated that the future planned work is within scope for the project.

Reviewer 3

The reviewers aid that the future work is a clear follow on to the prior works and represent necessary steps to fully realize/demonstrate the benefits of the technologies being developed.

Reviewer 4

The reviewer commented that in the Q&A portion of the presentation, a lot of time was spent talking about developing SAE International standards (and how this is key for getting OEMs to consider changing their ACC algorithms). However, this is not at all mentioned in the future work (or in the slides at all). The reviewer would have loved to hear more about this at the next Annual Merit Review (AMR), because it sounds like it is the key to getting this work deployed.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer stated that automation in traffic is a much needed push to optimize the energy utilization during commute.

Reviewer 2
The reviewer commented that ACC is an increasingly used technology, so understanding its impacts and improving vehicle efficiency is certainly relevant and supportive of VTO's mission.

Reviewer 3
The reviewer stated that the broad range of simulation tools and development and testing of connectivity and automation technologies clearly aligns with the EEMS Program objectives.

Reviewer 4
The reviewer said that the EEMS Program envisions an affordable, efficient, safe, and accessible transportation future in which mobility is decoupled from energy consumption. This work has identified that production ACC algorithms penalize fuel economy and that new control algorithms are necessary to make Level 1 (L1), and Level 2 (L2) automation features more eco-friendly.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1
The reviewer commented that the team is well supported.

Reviewer 2
The reviewer said that no information was provided to indicate that funding was insufficient.

Reviewer 3
The reviewer said that the large group and broad scope of the work require an extensive set of resources from all partners. The scope of work, requirements for the integration of the partner efforts, and overall availability of resources appear to be well aligned.

Reviewer 4
The reviewer stated that this work is on schedule and budget.

Presentation Number: EEMS095
Presentation Title: Integrated Control of Vehicle Speeds and Traffic Signals for Reducing Congestion and Energy Use
Principal Investigator: Jinghui Yuan, Oak Ridge National Laboratory

Presenter

Jinghui Yuan, Oak Ridge National Laboratory

Reviewer Sample Size

A total of five reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

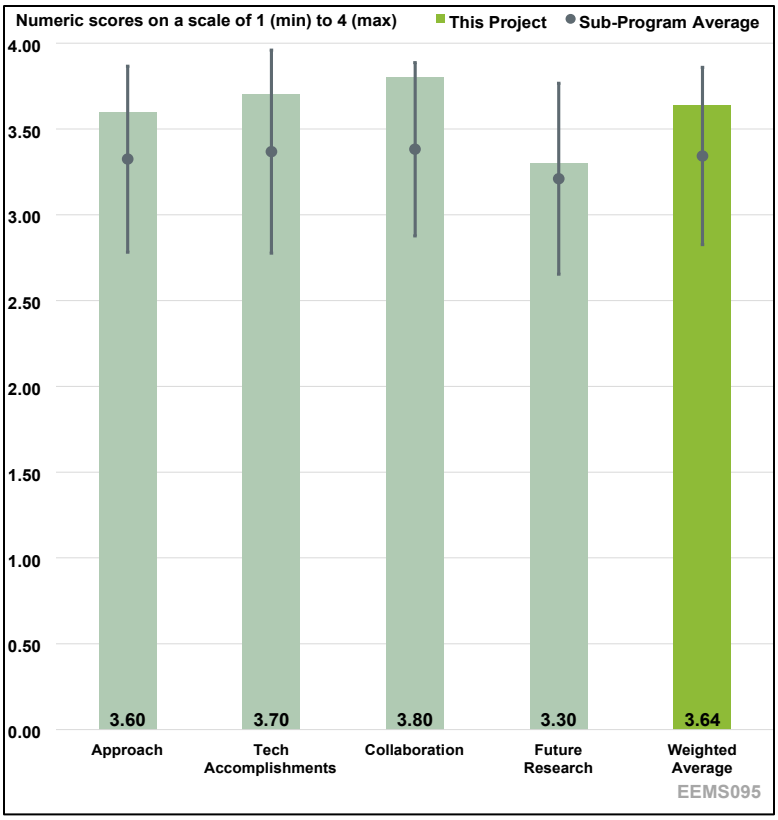

Figure 4-9. Presentation Number: EEMS095 Presentation Title: Integrated Control of Vehicle Speeds and Traffic Signals for Reducing Congestion and Energy Use Principal Investigator: Jinghui Yuan, Oak Ridge National Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer commented that there was a multi-level approach for the signal and vehicle controller developed and tested in simulation, dyno lab, and on-road. Additional detail on work done with vehicle OEM and city would be appreciated.

Reviewer 2

The reviewer commented that it was a well-planned project with a good mix of modeling and real-world testing, with help from car-manufacturer. The reviewer would have liked to hear how congestion level would impact the results. The assumption seemed to be that there would be reasonable traffic flow.

Reviewer 3

The reviewer said that the awardee is able to demonstrate that the integrated vehicle and signal control can provide up to 22% vehicle-level energy saving compared to non-controlled vehicles, which is significant. Additionally, other energy savings contributions are found in queue length prediction in congested and higher connected and automated vehicle (CAV) penetration scenarios.

Reviewer 4

The reviewer commented that the project aims to develop integrated control methods combining real-time traffic signal timing and CAV velocity profiles. The approach to the problem is well designed, with interconnected vehicle and signal control loops, simulation, and on-road demonstration.

Reviewer 5

The reviewer noted that the project approach was very good. The project team was able to answer many of the questions related to “connected vehicle” approaches to more efficient travel on traffic signalized roads. The approach to the real-world testing with the prototype vehicle had limitations with respect to generalizing the results. This was because the on-road testing was very limited and could not capture the variability of traffic volume and traffic signal status that would normally be encountered throughout the day. Any extrapolation of the on-road testing results cannot really be made. However, the on-road testing was a great validation of the feasibility of a connected vehicle approach for cooperative travel on traffic signalized intersections.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer commented that the project demonstrated a 24-27% improvement in vehicle energy savings through the vehicle and signal controller compared to a baseline of actuated signal control. Variation of tests on no queue length prediction, implementable queue length prediction, and ideal (perfect) queue length prediction. Simulation (120k+ tests) is augmented with vehicles-in-the-loop (ViL) testing (148 tests) and week-long field experiment upon a corridor (35 tests). Substantial improvement in arrival on green and decreased wait times is demonstrated. Fusing of vehicle radar data with infrastructure data collection for queue length prediction is novel. Several publications have come from this work.

Reviewer 2

The reviewer said that the project has achieved its primary goals of demonstrating integration of Signal Phase and Timing (SPaT) and CAV technology to improve traffic flow. It is an impressive mix of hardware demonstration and modeling predictions.

Reviewer 3

The reviewer said that simulation, ORNL’s Connected and Automated Vehicle Environment (CAVE) laboratory testing, on-road demonstration (signal timing control and vehicle control and Traffic Technology Services (TTS) real-time SPaT data evaluation) are all demonstrated in this presentation. One feedback to the presenter: please substitute images of codes and Microsoft Excel files to more relevant graphs/information.

Reviewer 4

The reviewer commented that most of the critical milestones and timelines planned are met except the one planned for April. As the last two milestones are improvements, for the final report, the reviewer believes the team can accomplish it within the given timeline.

Reviewer 5

The reviewer noted that the project is mostly complete, and the team made great accomplishments in the three phases of: simulation analysis, laboratory testing, and on-road prototype testing.

Question 3: Please comment on 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?

Reviewer 1

The reviewer commented that the necessary partnerships have been established (traffic signal control, vehicle manufacturer, various national laboratories) to make the project successful. The work required significant contributions from different partners to make it all work.

Reviewer 2

The reviewer said that the project demonstrates clear collaboration and coordination with Toyota, City of Chattanooga and NREL.

Reviewer 3

The reviewer noted that the team consists of great partners supporting integration and implementations, not only for this project but also for other multiple EEMS projects.

Reviewer 4

The reviewer said that the team appears to have had outstanding collaboration among the key partners of ORNL, NREL, Toyota, and the City of Chattanooga. The reviewer stated that all partners had key aspects to the project, so collaboration and coordination was critical to the success of this project.

Reviewer 5

The reviewer stated that collaboration consisted of national laboratories, vehicle OEMs, and city team members, each with clearly defined roles according to strengths. The reviewer stated that more detail on the work done by vehicle OEMs and city team members would be helpful.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer stated that additional on-road testing and ViL testing from real-world data, as noted, will strengthen project and enhance investment.

Reviewer 2

The reviewer stated that the next steps are logical and added that the reviewer is not able to judge how much of a challenge the proposed roads will be (busier?).

Reviewer 3

The reviewer commented that the project missed an opportunity to provide further details on how the future projects will help address the remaining challenges and barriers.

Reviewer 4

The reviewer commented that the proposed future research seems reasonable, with more on-road tests and its utilization for better energy benefit evaluation. It would be nice to see how the project results can be shared and interconnect with other EEMS projects from ORNL in the long term.

Reviewer 5

The reviewer said that the future work includes additional on-road testing and integration of the on-road test data into the laboratory environment for more valid laboratory results. A few other areas for the team to consider could be: 1) What could be the benefit of a lower latency SPaT data transmission (e.g., communicated via cellular-vehicle-to-everything (C-V2X) versus the “high”

latency SPaT data provided by TTS? 2) What could be the benefit of implementing the assured Green Period that is being developed for CV applications at actuated traffic signals?

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer noted that the novel signal and vehicle controller demonstrate substantial energy and traffic efficiency improvement.

Reviewer 2

The reviewer stated that the project is a good example of the kinds of beneficial technology synergies the EEMS team is trying to validate and doing it with real-world demonstrations.

Reviewer 3

The reviewer noted that the project was able to develop and demonstrate an integrated controls strategy that combines real-time traffic signal timing and vehicle speed controls for CAVs. This is relevant to the EEMS and Analysis VTO objectives.

Reviewer 4

The reviewer commented that the project aligns well with other EEMS projects and VTO's goals of optimizing energy consumption through connectivity.

Reviewer 5

The reviewer commented that this project is very focused on EEMS related goals for using technologies (e.g., CV related) to improve vehicles' energy efficiency on roads.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer commented that the project team members bring expertise in controls, simulation and vehicle testing, and real-world deployment hardware. Each is used effectively at various stages in the project.

Reviewer 2

The reviewer said that the work is on time and on-budget. The presenter did not indicate constraints on progress due to lack of resources.

Reviewer 3

The reviewer said that the project is able to demonstrate that with the provided resources and collaborations, is able to achieve the stated milestones.

Reviewer 4

The reviewer said that the project has a great team with sufficient resources to perform all planned research.

Reviewer 5

The reviewer stated that the funding seems adequate to finish the current scope. However, more robust on-road testing could be performed in a variety of traffic conditions or with additional vehicles if additional resources were available.

Presentation Number: EEMS097
Presentation Title: Micromobility-Integrated Transit and Infrastructure for Efficiency (MITIE)
Principal Investigator: Andrew Duvall, National Renewable Energy Laboratory

Presenter

Andrew Duvall, National Renewable Energy Laboratory

Reviewer Sample Size

A total of three reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 67% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 33% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

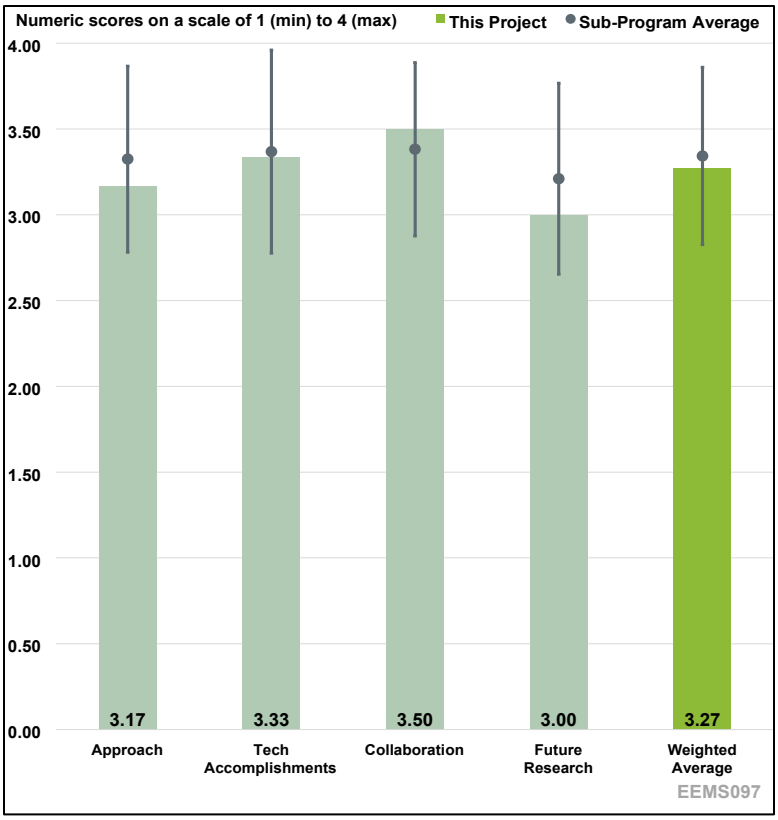

Figure 4-10. Presentation Number: EEMS097 Presentation Title: Micromobility-Integrated Transit and Infrastructure for Efficiency (MITIE) Principal Investigator: Andrew Duvall, National Renewable Energy Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer stated that based on the presentation, oral and written, the chief technical barrier is acquisition of micromobility data. It was striking to hear that this project has the largest dataset about e-bikes of any study, and its dataset is relatively modest in size. This project can, and probably should, be regarded as a proof of concept as to the value of scaling up the study and figuring out how to overcome the data barriers.

Reviewer 2

The reviewer commented that the project topic is of interest. However, not much technical approach was discussed during the presentation. With the limited technical information shared, it is difficult to evaluate viability of the methodology. However, the data used for the study, while is relevant, is not clear if it is representative enough and might have been needed to explore further or at least share the results on its viability for the purpose of the work.

Reviewer 3

The reviewer thinks that the research questions are on target, but even greater emphasis on equity for low-income/underrepresented groups in both urban and rural areas is important. Less impactful

to energy considerations, perhaps, but more impactful to equity is the rural component of Micromobility-Integrated Transit and Infrastructure for Efficiency (MITIE) for both personal and freight mobility.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer said that on the surface, the analysis does indicate a benefit. Besides convenience and basic behavioral factors, to what extent do other factors (some controllable others not), such as weather, road safety and age/ overall health affect the viability of realizing the benefits?

Reviewer 2

The reviewer commented that this is a well-conceived and well-managed project that appears to be hitting all milestones comfortably. It lays out a thorough and well-rounded set of research questions that cover energy use, climate impacts, and behavioral patterns as well several different angles on quality of life, inclusiveness, markets, ownership/access, and real-life use cases and community scenarios for testing the benefits and barriers associated with e-bikes/micromobility vehicles. This is quite a multi-faceted agenda that takes full advantage of the funding, partnerships and opportunities available for conducting research.

The reviewer added the scope of the study is wide and thin, which is not a criticism as much as an acknowledgment that much more could be done. The questions for this research are really what more is needed, for what and by whom? How large should the evidence base be about micromobility to support what purposes? Based on this research, results could be useful for informing city policy, federal strategy, market developments to increase ridership/adoption, design of equity-oriented rideshare programs, and even for understanding EV adoption. In short, the project has illuminated many fruitful directions that further work on micromobility could go, with some winnowing based on input from its many stakeholders.

Reviewer 3

The reviewer said that lots of progress has made. However, the remaining Fiscal Year 2024 work (in progress) sounds more than 4% of the total. Though, due to lack of time for presentations, the presenter might have not got a chance to dig in further and explain.

Question 3: Please comment on 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?

Reviewer 1

The reviewer stated that the collaborations across laboratories and in particular with industry/city partners, makes this valuable. Expanding collaboration to a rural community to understand the opportunities for freight and personal mobility may uncover useful barriers and equity concerns.

Reviewer 2

The reviewer said that this project has, somehow, assembled an exceptionally large and varied set of partners and collaborators including four national laboratories, about a dozen cities nationwide, several universities, and state and federal agencies. If this set of partners meaningfully engages through the project, it is a huge asset and significant indicator of progress and potential for relevance. It is time-consuming to reach out to so many partners and not always easy to get their

attention and agreement to participate in a research project. The research results and progress reporting do suggest meaningful engagement by stakeholders, which is all very impressive.

Reviewer 3

The reviewer said that collaboration could have been explained further and detailed of the roles of the partners.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer said that the plans are not described in detail. Main question is lack of credential and representative data. Until such data become available, further analysis will be very limited.

Reviewer 2

The reviewer said that the level of effort, the scope of the proposed research is appropriate. However, additional focus on micro-freight modes, perhaps beyond just e-bikes, may be a more productive area. What is unclear, perhaps, is the definition of the target, and what the collective impact on freight and personal mobility is of switching to micro-mobility modes, and its magnitude in relation to other energy reduction initiatives.

Reviewer 3

The reviewer stated that the project scope, progress toward the plan, relevance, and inclusion of stakeholders point to the solid foundation for future research laid by this current project, which is still in progress. Of the several promising next steps that could be taken, it could be valuable to construct a process for winnowing to priorities, possibly involving the stakeholders. A current theme across the project is evaluating how approaches to city planning and programs increase usage of owned or shared e-bikes/micromobility vehicles and how that relates to community goals for both emissions reduction and improving quality of life. It seems like a viable strategic direction to continue and scale, to the extent feasible given the challenges of data acquisition.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer said that the project supports EEMS and Mobility programs.

Reviewer 2

The reviewer commented that the project's relevance to first-mile/last-mile, reducing congestion, and maximizing efficiency/optimizing MEP are all supportive of the subprogram objectives and worthy of research and analysis.

Reviewer 3

The reviewer noted that the focus on electric bikes and the general category of "emissions-free vehicles that are much smaller than cars" corrects for a lack of deep knowledge about this topic despite a substantial increase in e-bikes during the past several years and a need to explore all options for personal transportation flexibility as part of the energy transition. E-bikes have been regarded as niche, luxury goods and perhaps dismissed as a significant contribution to decarbonizing transportation. This study suggests otherwise, taking a much broader look at patterns of usage, and asking what it would take for them to become mainstream and what both decarbonization and quality of life implications might be. It is a thoughtful and sophisticated research project with room to grow.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer stated that the allocated budget sounds more than enough to get the milestones competed in a timely fashion.

Reviewer 2

The reviewers said that the resources of the project are modest, but sufficient for the scope defined.

Reviewer 3

The reviewer commented that the current budget is about right for a robust pilot or modest proof of concept. It is not sufficient to expand.

Presentation Number: EEMS098
Presentation Title: Optimizing Drone Deployment for More Effective Movement of Goods
Principal Investigator: Victor Walker, Idaho National Laboratory

Presenter

Victor Walker, Idaho National Laboratory

Reviewer Sample Size

A total of four reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

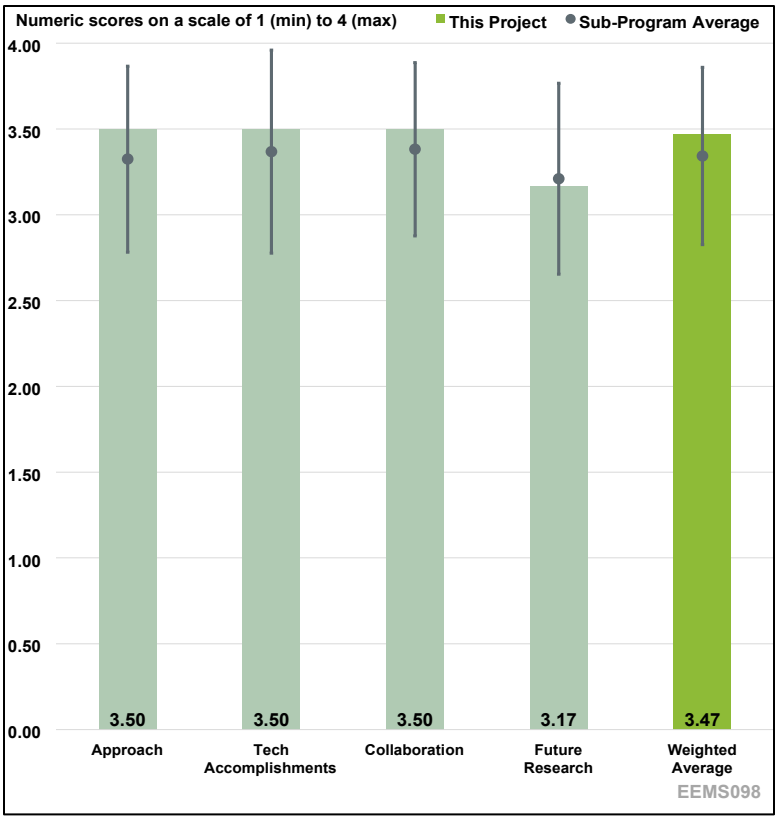

Figure 4-11. Presentation Number: EEMS098 Presentation Title: Optimizing Drone Deployment for More Effective Movement of Goods Principal Investigator: Victor Walker, Idaho National Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer said that the project focused on assessing two different types of drones (rotary and vertical take-off and landing (VTOL)) for efficiency in delivering goods to people. The project is well designed and considered key variables such as temperature, wind speed, and drone technology.

Reviewer 2

The review stated that this an outstanding area to focus effort. Drones have a reasonable potential for reducing energy consumption in freight and microfreight movement.

Reviewer 3

The reviewer commented that there was overall good progress, but it is difficult to assess energy impacts and performance of new technology. Technology impacts reviewed with respect to constrains on weather and delivery. Slide 13 discuss energy with respect to baseline, but baseline is not clear. Not sure what to do with the kilowatt-hour (kWh) numbers and what this means. What is the delta compared to existing delivery methods?

Reviewer 4

The reviewer noted that the project aims to manage and operate heterogeneous vehicles in delivery to increase energy efficiency. The analysis of the mixed-fleet scenarios and the results by including ground vehicles to handle the impacts of the weather were clearly shown. A public tool has been introduced to calculate energy and compare routes, energy, and fleet optimization, which is an excellent aspect of the project. Heuristic approaches were developed to have near-optimal solutions instead of putting in high computational efforts to achieve optimal results, which seems a proper approach.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer stated that based on the planned timing and milestones, the project is right on track. The last two milestones are tough, and the reviewer looks forward to seeing the results next year.

Reviewer 2

The reviewer commented that the project is complete and met its primary goals of evaluating goods delivery by drone under different conditions. The team considered the effects of wind speed, temperature, delivery weight, and other variables on energy use. For example, VTOL drones could safely and efficiently deliver goods at temperatures above freezing and wind speeds up to 40 mph, while rotary models perform better at lower temperatures but cannot withstand higher wind speeds.

Reviewer 3

The reviewer commented that the focus on technical barriers may not necessarily be appropriate, as the real potential for the technology may not be manifested yet. As such, it may be useful to explore more speculative scenarios, which would perhaps present a different set of challenges than those identified. As an example, if the potential energy savings can be represented by (energy saved/drone)*(# of drones), then assuming that the energy benefit in relation to ground transport is around 100:1 (Slide 15), would a re-examination of the effect of utilizing numerous larger drones (which may be more weather resilient) on the hub-and-spoke paradigm for freight mobility be a worthwhile exercise?

Reviewer 4

The reviewer commented that it was not clear what the calculations for energy comparisons are being done. Are the calculations assessed on done type? What about new tech drones? Results in calculation window do not seem to be useful (e.g., total energy for flight is 259642.85714285713 Watthours). What decision is this supporting?

Question 3: Please comment on 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?

Reviewer 1

The reviewer noted that the project team collaborated with drone manufacturers, delivery companies, and customers. No additional collaboration seems to be needed.

Reviewer 2

The reviewer stated that the collaborations are appropriate, but more acquiring more data quickly will be important, with a focus on greatest energy reduction opportunities in the 10-year timeframe (i.e., not the near-term).

Reviewer 3
The reviewer commented that additional information of activities/outcomes with collaborators would be beneficial.

Reviewer 4
The reviewer said that collaboration and coordination within the project team (with many partners and supporting collaborations) are listed as challenges, especially with scheduling meetings and robustness, but the results show that the team has managed the collaboration. It would be critical to meet the changing marketplace needs before releasing and maintaining public tools to be used in the field as expected.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1
The reviewer stated that the project has ended, however the presenter noted potential to evaluate drone delivery for medical/trauma applications and considering launching drones from mobile vehicles as well as central locations. Launching drones from trucks could help serve more rural areas in particular.

Reviewer 2
The reviewer commented that the continued development and refinement of the tools is important, but greater focus on use cases that present most substantial energy opportunities (perhaps using MEP as a metric) may be needed. For example, food delivery may be a good validation case, but maybe not form a robust business solution resulting in substantial energy and productivity savings.

Reviewer 3
The reviewer said that the project is nearing its end at 85% complete.

Reviewer 4
The reviewer said it would be great to see how the tools will be maintained and updated based on the market needs to be utilized widely in the field. If the heuristics for near-optimal solutions could be shared with the public with open-sourced, it would be a great benefit to the society and would be happy to see the plan for it.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1
The reviewer stated that the project supports VTO objectives, including EEMS and Electrification. The drones used in this study are electric and drones can help shift deliveries off of trucks and vans to more efficient devices.

Reviewer 2
The reviewer commented that drones are very much relevant to the EEMS subprogram objectives. The reviewer suggests that this program should also recognize and explore the potential equity aspects for both urban and rural communities.

Reviewer 3
The reviewer said that mixed mode delivery services is a key technology moving forward with the promise and challenges in robustness and energy consumption. Project is addressing some of these.

Reviewer 4

The reviewer stated that the project analyzed mixed-fleet systems with heterogeneous drones (and ground vehicles) and targeted to optimize energy consumption with given conditions. The public tools developed through this project will significantly benefit society by allowing them to analyze and plan for their system during the operations or planning for operations.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer noted that the project is complete. No mention of resource or funding gaps was made in the presentation.

Reviewer 2

The reviewer said that the project has a great team with excellent partners and experts in the field to handle the problems.

Reviewer 3

The reviewer commented that as the project grows from being more exploratory in nature to addressing clearly defined transport problems. The reviewer believes the trajectory for the project funding should trend upward.

Presentation Number: EEMS099
Presentation Title: Metrics for Assessing the Impacts of Energy-Efficient Mobility Systems
Principal Investigator: Venu Garikapati, National Renewable Energy Laboratory

Presenter

Venu Garikapati, National Renewable Energy Laboratory

Reviewer Sample Size

A total of four reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 75% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 25% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

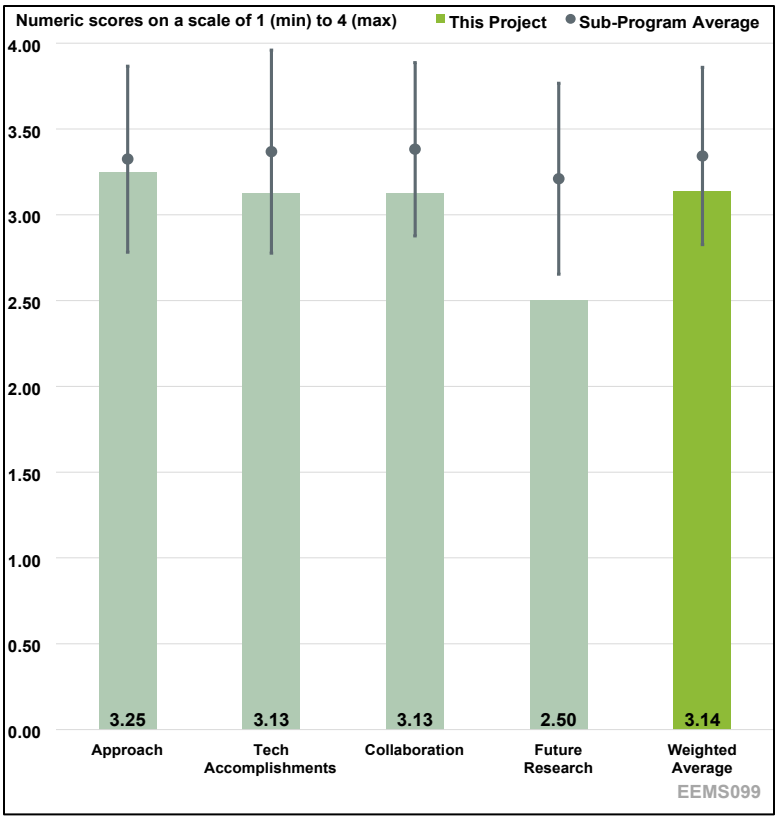

Figure 4-12. Presentation Number: EEMS099 Presentation Title: Metrics for Assessing the Impacts of Energy-Efficient Mobility Systems Principal Investigator: Venu Garikapati, National Renewable Energy Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer noted that the MEP metric and the process for calculating it is quite worthwhile to DOE, DOT, and state agencies to analyze potential mobility projects.

Reviewer 2

The reviewer stated that the technical barriers were well-addressed by the project, and all project milestones were met. The project conducted studies using the metric for two state DOTs and evaluated source data for the metric by comparing two open data sources and was able to identify a superior dataset to use as an input for the metric. The project was well-designed to develop and refine the metric.

Reviewer 3

The reviewer commented that the project effectively addressed many of the technical barriers. The project defined the MEP metric, which provides a practical, common baseline to evaluate infrastructure investment projects using open-source datasets.

Reviewer 4

The reviewer said that one of the barriers is listed as the need for open and practical metrics to quantify energy productivity of mobility, but it is unclear what factors are used to calculate the MEP. The possible MEP value is not bound by a set or standardized range leading the MEP for the exact same location to change disproportionally, instead of relatively, based on different data sources, so it is difficult to compare the MEP beneficially across use cases. These factors also hinder meeting the barrier of accurately measuring the transportation system's energy impact (Second key barrier listed).

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer said that the project is complete, and the successful examples of MEP analysis are listed.

Reviewer 2

The reviewer said that the project made expected progress compared to the project plan. Calculations were reduced from four hours to three minutes.

Reviewer 3

The reviewer commented that the project team made significant technical progress during the project timeline and have met project milestones and carried out studies to further refine the metric. The two state DOT collaboration projects mentioned in the presentation demonstrate the utility of the tool to measure impact of mobility improvements and transportation systems. It would be interesting to see collaborations with different types of organizations other than state DOTs - for example, regional planning commissions, cities, transit agencies - to demonstrate the utility and relevance of the metric among various groups. The presentation does highlight the success of the metric, and that it is being used in other DOE-funded projects, at other federal agencies, by industry groups, and non-profits.

Reviewer 4

The reviewer commented that the project plan seems to be comparing, OpenStreetMaps vs. Overture (complete) and applying MEP to various use cases. Although MEP was used with DOTs, the lack of standardization of the MEP questions its usefulness in its current state.

Question 3: Please comment on 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?

Reviewer 1

The reviewer commented that since the project is complete, there was no need to explain the various partner relationships.

Reviewer 2

The reviewer said that the collaboration with project partners appears to be good, and partners are well-integrated into the presentation. It does seem like collaboration with a wider variety of organizations would be helpful, to assess accessibility of the metric and relevancy for different use cases and needs.

Reviewer 3

The reviewer commented that the project team achieved positive and useful collaboration, including with LBNL and ANL and from two state DOTs, with a third DOT collaboration underway. The collaborations are exploring scenarios of transit enhancements, pedestrian/bicycle enhancements.

Reviewer 4

The reviewer noted approximately 15 partners and collaboration across the U.S. However, besides the handful of early adopting organizations (Podaris, American Council for an Energy-Efficient Economy, the level of contribution by each collaborating organization is unclear. Getting direct potential customer feedback would improve the tool.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer hopes the Python tool can be funded so that this MEP analysis can be easily used by other U.S. DOE/DOT projects, as well as state agencies and universities. The reviewer would like to see the tech integration corridor projects use this type of analysis to evaluate corridors.

Reviewer 2

The reviewer notes that the project has concluded. However, the presentation does include ideas for future research activities, which primarily focus on lowering the barrier to adoption of the metric, which seems like a logical next step.

Reviewer 3

The reviewer stated that the project has defined a purpose for future work, including developing more rapid analysis capabilities, publishing MEP as an open-source library, and disseminating MEP as an evaluation tool more widely.

Reviewer 4

The reviewer commented that future plans focus on making MEP more accessible; however, the greatest needs are in the technical development and clearer value proposition of the tool.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer described the research as highly relevant.

Reviewer 2

The reviewer said that the project is highly relevant to the EEMS team, and the MEP metric is already being used by other EEMS projects.

Reviewer 3

The reviewer said that the project can provide a novel, dynamic and effective way to evaluate energy reduction capabilities of infrastructure projects. The project supports VTO subprogram objectives.

Reviewer 4

The reviewer commented that the focus is mostly on EEMS and Analysis.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer noted that the project is complete.

Reviewer 2

The reviewer stated that the project team successfully completed the project with the provided resources, and had some, but not a lot, of leftover funding.

Reviewer 3

The reviewer commented that the resources are sufficient to achieve the milestones within the remaining project timeframe.

Presentation Number: EEMS100
Presentation Title: Dynamic Curb Allocation
Principal Investigator: Nawaf Mohammed, Pacific Northwest National Laboratory

Presenter

Nawaf Mohammed, Pacific Northwest National Laboratory

Reviewer Sample Size

A total of four reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 75% of reviewers felt that the resources were sufficient, 25% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

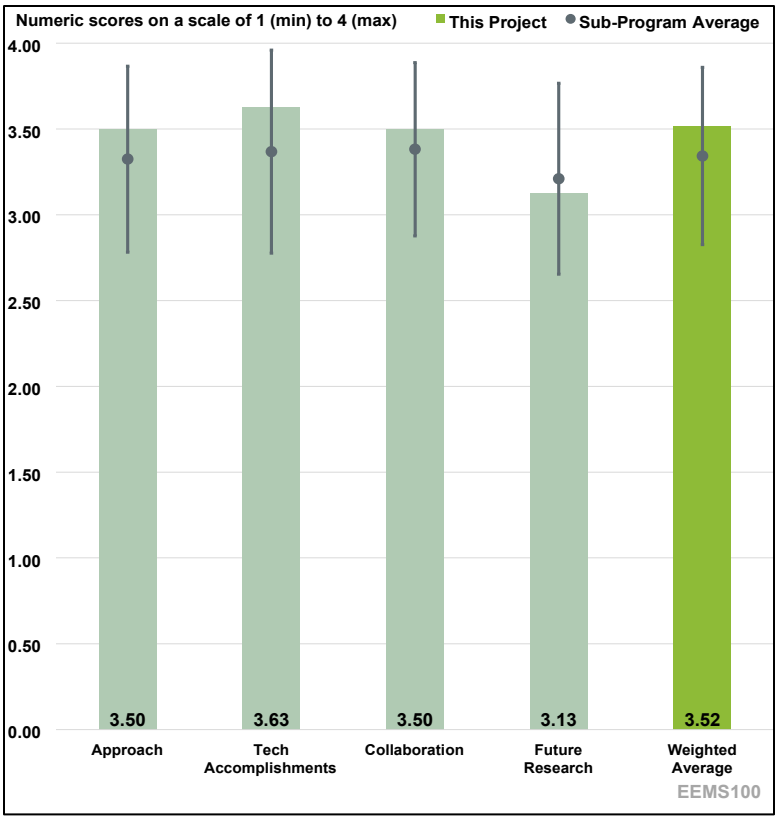

Figure 4-13. Presentation Number: EEMS100 Presentation Title: Dynamic Curb Allocation Principal Investigator: Nawaf Mohammed, Pacific Northwest National Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer said the approach was excellent, and the project clearly defines problem statements and solutions to improving traffic patterns by reducing curb activity while supporting Electrical Vehicle charging opportunities. The reviewer recognized that the project addresses curb management and is an example of a transportation engineering problem municipalities are struggling with, roadway configuration features and environmental factors that impact travel speed vs. vehicle flow. The reviewer also comments that the project's work on understanding factors like curb use will be critical for optimizing energy supply chains, including curbside charging for EVs.

Reviewer 2

The reviewer commented that the project is well-designed, and the timeline was reasonably planned. The reviewer commended the project for addressing research needed in the growing field of curb management. Specifically, the demand for the curb spaces in city cores is growing from an increase in goods delivery to homes and less access to short and long-term curb spaces at major transportation hubs. The reviewer also commented that as the EV becomes more prevalent, it will also lead to competition and a balancing act of access to the charging ports and parking spaces.

Reviewer 3

The reviewer expressed that the project is well-designed to address technical barriers, such as curb management and testing of curb management allocation policies. The reviewer commented that the only weakness of the project is the specific sensor technology the team used to measure curb use is very expensive. However, the reviewer noted that the presenter indicated other technologies, such as automated license plate reading, could be used to replace the sensor.

Reviewer 4

The reviewer had concerns that the barrier in the project listed as, “Curb allocation has impacts on congestion, greenhouse gas emissions, system energy efficiency, and productivity”, was not resolved through the proposed curb management plan. The reviewer’s concerns were that models did not seem to be able to assess all these matrices and the results do not show benefits for each of these matrices.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer stated that one of the technical accomplishments in the project includes platform displays real-time parking status based on sensor data. The reviewer also commented that optimal curb allocation suggestions for future planning on curb-occupancy data available for access in the Livewire system brings full clarity to identify areas of concern. The reviewer also noted that the project has proof-of-concept in a cloud infrastructure hosting capability.

The technical accomplishments include platform displays real-time parking status based on sensor data. Optimal curb allocation suggestions for future planning on curb-occupancy data available for access in the Livewire system bringing full clarity to identify areas of concern. The also have proof-of-concept in a cloud infrastructure hosting capability.

Reviewer 2

The reviewer pointed out that the team was able to complete the project in the allotted time period. The reviewer specifically remarked that the team created Dynacurb to display real-time parking status based on sensor data. The reviewer also added that the team created an optimal curb allocation model to make suggestions for future planning. The reviewer commented that the team tested its tools in the real-world using variable message signs (VMS) to influence curb usage. The reviewer finalized that the test improved traffic conditions at the Seattle airport and reduced tailpipe emissions.

Reviewer 3

The reviewer commented on the success of the developed curb planning and management app being applied to an airport parking space. However, the reviewer also commented that the application to cities with the most opportunity to impact emissions and traffic is not demonstrated or discussed. The reviewer noted that the path to the market for public use where the curb parking areas are managed privately is not clear and recommended to further assess the path to market and the benefits to overall traffic and emissions in transportation and mobility systems.

Reviewer 4

The reviewer observed that the project has achieved the major objectives of the project. The reviewer expressed that the use of micro/macro simulators, Dynacurb platform, VMS, and the use of Amazon Web Services will further advance the research work in this area. The reviewer also noted

that sensors needed to be installed in San Francisco and Seattle for technology deployment did not come to fruition. The reviewer suggested access to sensor data in Miami might help with technology deployment. The reviewer also expressed that some additional information on benefit-cost would have been helpful.

Question 3: Please comment on 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?

Reviewer 1

The reviewer commended that the collaboration among the team members, including multiple national laboratories and universities, was presented well. The reviewer also commented that a path to the market requires further collaboration with industry and curb management software providers in the future.

Reviewer 2

The reviewer noted that all the collaborating partners contributed well and provided pieces of the project deliverables to make this project successful. The reviewer remarked that more partnerships with geographically diverse cities, airports/ports operators, logistics providers and ride-share companies would have been beneficial.

Reviewer 3

The reviewer stated that the project required collaboration with multiple different types of stakeholders, like Seattle city and multiple innovative private companies. Each team involved with the project made very specific and clear contributions.

Reviewer 4

The reviewer explained that the academic partners are all very good, but the project is missing municipalities and business partners. The reviewer recommended that the input from the business partners will add value as they are the biggest curb users, such as Uber, United States Postal Service, United Parcel Service, Federal Express, and Amazon.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer commented that the project is complete, and that future use of the systems developed can be used to curb policy development and enforcement.

Reviewer 2

The reviewer remarked that more discussions of any barriers for technology deployment and how best to overcome these barriers, in particular, availability of sensors, VMS systems, and associated infrastructure needed for technology deployment would be beneficial.

Reviewer 3

The reviewer commented that the proposed future research is focused on practical extensions of the project aimed at identifying the specific conditions under which these curb management techniques are most valuable. However, future work should not just be focused on modeling and theoretically assessing the benefits and limitations of the curb management techniques but also validating those predictions with more real-world implementation.

Reviewer 4

The reviewer observed that while EV curbside charging and finding cost-effective ways to detect open spaces are listed as possible next steps, the other items listed in the next steps look to be mostly concluding remarks. For example, it is stated that “curb activity may only impact traffic flow in extreme cases, such as in ports, transit hubs, sporting events.” Three questions were proposed: 1) What would be the benefit of the developed application and simulation tool on the overall transportation, mobility, traffic, and emissions? 2) Is there any additional data and testing needed to confirm this conclusion? 3) What would be the impact when we have a mixed fleet of vehicles from EV and internal combustion engine where some curb spaces are dedicated to EV charging? The reviewer suggested that there are other important scenarios to be further assessed in the future.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer agreed that the project is related to EEMS objectives to assess different software and digital technologies to improve traffic and emissions in transportation and mobility.

Reviewer 2

The reviewer stated that curb management will be a significant factor in EV charging as we transition increasingly to EV deployments nationwide.

Reviewer 3

The reviewer expressed that the project lines up nicely with the VTO subprogram objective for EEMS. As the demand for the curb spaces grows, management in a smarter manner would lead to smoother traffic flows and lower greenhouse gas (GHG) emissions.

Reviewer 4

The reviewer agreed that the project aims to reduce emissions and increase traffic flow using dynamic curb allocation techniques.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer commented that the project budget was spent and looked sufficient to complete milestones.

Reviewer 2

The reviewer stated that the project completed its intended tasks in the allotted time and within budget.

Reviewer 3

The reviewer suggested that the project should have business input as well as municipality input for a more accurate assessment of the issue.

Reviewer 4

The reviewer stated that the resources seem to be sufficient. However, it was also suggested that it will be good to see how project dollars have or could have advanced the political leadership, city managers, private operators and entities’ willingness or desire to do benefit-cost analysis to install sensors and associated infrastructure for better management of curb spaces.

Presentation Number: EEMS101
Presentation Title: RealSim, An Anything-in-the-loop Platform for Mobility Technologies
Principal Investigator: Max Chen, Oak Ridge National Laboratory

Presenter

Max Chen, Oak Ridge National Laboratory

Reviewer Sample Size

A total of four reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

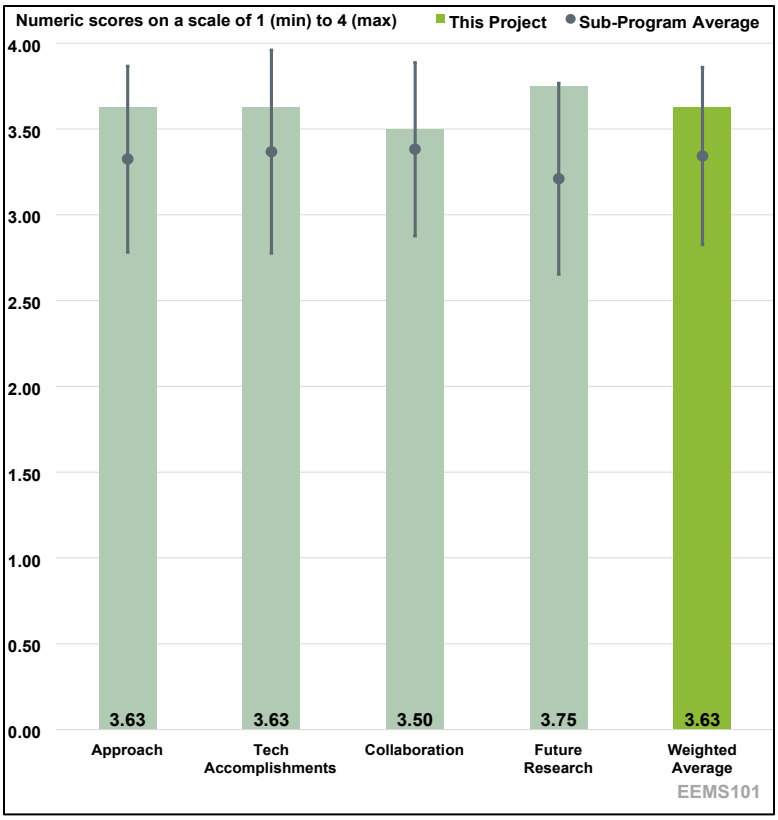

Figure 4-14. Presentation Number: EEMS101 Presentation Title: RealSim, An Anything-in-the-loop Platform for Mobility Technologies Principal Investigator: Max Chen, Oak Ridge National Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer commented that the project seeks to develop a flexible framework that can accommodate and integrate different models and data systems typically used in traffic simulations. The "gray box" concept is well-designed approach to achieve this.

Reviewer 2

This reviewer stated that the presentation indicates the deployment of FIXS on GitHub to be shared with the public, testing of Simulink vehicle dynamics models to replace CarMaker model, and refinement of the APaCK-V for future use cases along with data QA pipeline development and improved sensor validation.

Reviewer 3

The reviewer commented that this project well addressed barriers such as computational requirements of complex environmental simulation, and it is not easy to improve.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer commented the project for completing its milestones and goals, which is outstanding given the reduced staff and changing of project PI. The presentation indicates the deployment of FIXS on GitHub to be shared with the public, testing of Simulink vehicle dynamics models to replace CarMaker model, and refinement of the APACK-V for future use cases along with data QA pipeline development and improve sensor validation.

Reviewer 2

The reviewer stated that this project successfully integrated Carla-Simulink-Dynamometer simulation and also developed a prototype, as well as, provided two open-source data sets.

Reviewer 3

The reviewer stated that the project is complete and has accomplished the desired objectives to implement the framework.

Question 3: Please comment on 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?

Reviewer 1

The reviewer explained that the project involves collaboration between ORNL, ANL, an automotive OEM, and software developer IPG Automotive. The reviewer also added that the nature of the project requires close and precise cooperation between the partners to achieve a successful integration effort.

Reviewer 2

The reviewer stated that this project well-coordinated with ANL to efficiently work together to complete corresponding tasks.

Reviewer 3

The reviewer said that the awardee highlighted the collaborators of the project and their overall contributions. However, it was also commented that a weakness of the project was that the presenters did not provide specific details of their contribution. For example, there is no mention of how Ford provides critical feedback to the simulation and XIL testing and in which areas.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer agreed that the proposed future work is appropriate. The reviewer also asked if for the “gray box” concept to be more influential, would it need to be offered (included in software distributions) by the companies whose software is being integrated?

Reviewer 2

The reviewer confirmed that the proposed future research is solid.

Reviewer 3

The reviewer explained that the awardee has clear future reach and development goals. However, no estimated time of completion was provided.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer remarked that the project enables more sophisticated, realistic and flexible modeling of traffic situations, enabling demonstration of Energy Efficient Mobility System technologies to improve traffic flow in the transport system.

Reviewer 2

The reviewer confirmed that the project addresses VTO Analysis and EEMS program objectives.

Reviewer 3

The reviewer agreed that this project support the Analysis and EEMS objectives.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer commented that the project is complete, though some work has apparently been moved to a different project due to personnel shortages last year.

Reviewer 2

The reviewer stated that the proposer has finished his research in timely fashion and no financial roadblocks are mentioned.

Reviewer 3

The reviewer agreed that the resource for this project is sufficient.

Presentation Number: EEMS105
Presentation Title: Energy Optimization of Light- and Heavy-Duty Vehicle Cohorts of Mixed Connectivity Automation and Propulsion System Capabilities via Meshed V2V-V2I and Expanded Data Sharing
Principal Investigator: Darrell Robinette, Michigan Technological University

Presenter

Jungyun Bae, Michigan Technological University

Reviewer Sample Size

A total of three reviewers evaluated this project.

Project Relevance and Resources

67% of reviewers felt that the project was relevant to current DOE objectives, 33% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

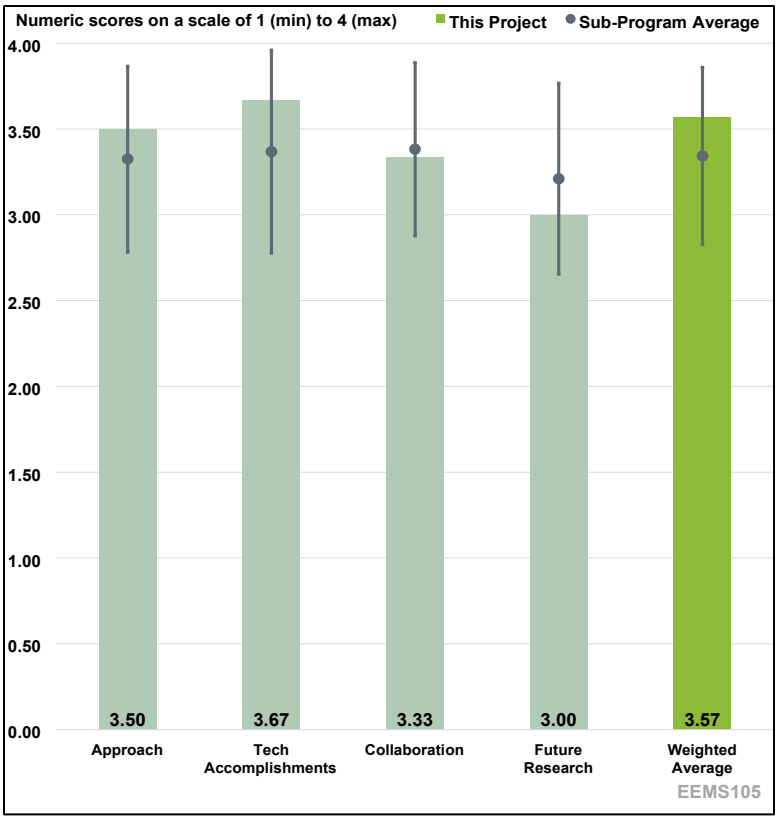

Figure 4-15. Presentation Number: EEMS105 Presentation Title: Energy Optimization of Light- and Heavy-Duty Vehicle Cohorts of Mixed Connectivity Automation and Propulsion System Capabilities via Meshed V2V-V2I and Expanded Data Sharing Principal Investigator: Darrell Robinette, Michigan Technological University

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer expressed that the approach to investigating mixed vehicle swarms with connected and automated vehicle coordination in multiple infrastructure types was innovative and necessary to identify opportunities and boundaries of future cylinder deactivation systems. The mixing of the vehicles' order to consider drag effects across vehicle powertrains and body types was also innovative. Additionally, the timeline was appropriate for the phases of the project.

Reviewer 2

The reviewer noted that the approach of simulation to controlled testing and finally, on-road testing is effective and key assumptions are nicely detailed. The reviewer suggested that it would be helpful to have clear goals for each of these and better define how the design of experiment results led to a smaller subset of tests going ultimately to on-road testing.

Reviewer 3

The reviewer commented that the project and approach taken is complex. However, concern was expressed that although the presentation states that barriers were addressed, a number of project aspects that are declared completed are not mentioned at all in the results.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer explained that the findings from simulation and test track identify optimal energy efficiency targets for mixed vehicle swarms. The combination of vehicle orders and types of infrastructure has provided target performance for future public road deployment. The demonstration of light-duty vehicle efficiency on public roads reinforced the strength of the approach, even though the HD truck powertrain and transmission did not adhere to the digital twin following performance. The reviewer concluded that the needs that have been identified by this project will inform future research with HD trucks and C-V2X communications.

Reviewer 2

The reviewer commented that while the upper end of the improvement range did not seem to be accomplished, the breadth and depth of the testing and analysis is impressive. The project demonstrated a substantial improvement in energy consumption (10-50%) in multiple important transportation scenarios. The reviewer also noted that several publications came from this work or are in progress.

Reviewer 3

The reviewer expressed concerns that the project was accomplished with marginal benefits. The project schedule mentions real public road testing. However, no mention of such testing was found. The reviewer also noted that all field results are from a closed track demonstration and experiments. The reviewer continued that given the ideal and control conditions, the marginal energy savings compared to the system complexity and requirements, questions whether this solution can have a realistic real-world implementation. A lot of knowledge was gained by this research exercise but if there is going to be any benefit it will be incremental.

Question 3: Please comment on 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?

Reviewer 1

The reviewer noted good coordination and allocation of skills and tasks across all partners.

Reviewer 2

The reviewer observed addresses collaboration within the project team with multiple businesses covering vehicles, simulation, and connectivity, along with a nonprofit for test track use. The reviewer commented that additional detail on the separation of tasks for light-duty powertrain modeling would be helpful as two teams share this.

Reviewer 3

The reviewer commented that this project included a lot of big names as partners, but it is not clear what was the contribution of most of the partners other than providing access to proprietary systems. Michigan Technological University seems to have made the largest part of the effort with AVL powertrain second. The reviewer could not find anywhere in the presentation any discussion that

shows interest from entities like Navistar and BorgWarner in commercializing the developed technology.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer stated that the project is 100% complete. The reviewer continued that there is a slide discussing further research but given the basic research nature of the project, there can always be more research.

Reviewer 2

The reviewer suggested that the study and improvement of connectivity latency would be welcomed. The reviewer also mentioned that future work for the digital twin effort such as gathering data from non-fleet vehicles was noted.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer commented that mixed fleet analysis and demonstration of cylinder deactivation is novel work needed in this field.

Reviewer 2

The reviewer said that the outcomes of the project support advancement and knowledge of process, equipment, powertrain, mobility management, and components.

Reviewer 3

The reviewer observed that the project has developed an overcomplicated system that depends on a lot of unstable factors to produce marginal energy savings. The research teams did not illustrate how the SoS approach can be scaled to real world scales.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer commented that having diverse team members meets the needs of the project in terms of simulation and physical testing.

Reviewer 2

The reviewer commented that this project accomplished a lot with the given resources and although the results may be less than practical, the advancement of basic concepts was real.

Reviewer 3

The reviewer expressed the concern that it is not clear that additional resources would overcome the challenge of getting the physical HD truck to follow the requested speed profile or improve C-V2X connectivity.

Presentation Number: EEMS106
Presentation Title: Developing an Energy-Conscious Traffic Signal Control System for Optimized Fuel Consumption in Connected Vehicle Environments
Principal Investigator: Mina Sartipi, University of Tennessee Chattanooga

Presenter

Osama Osman, Leidos

Reviewer Sample Size

A total of five reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

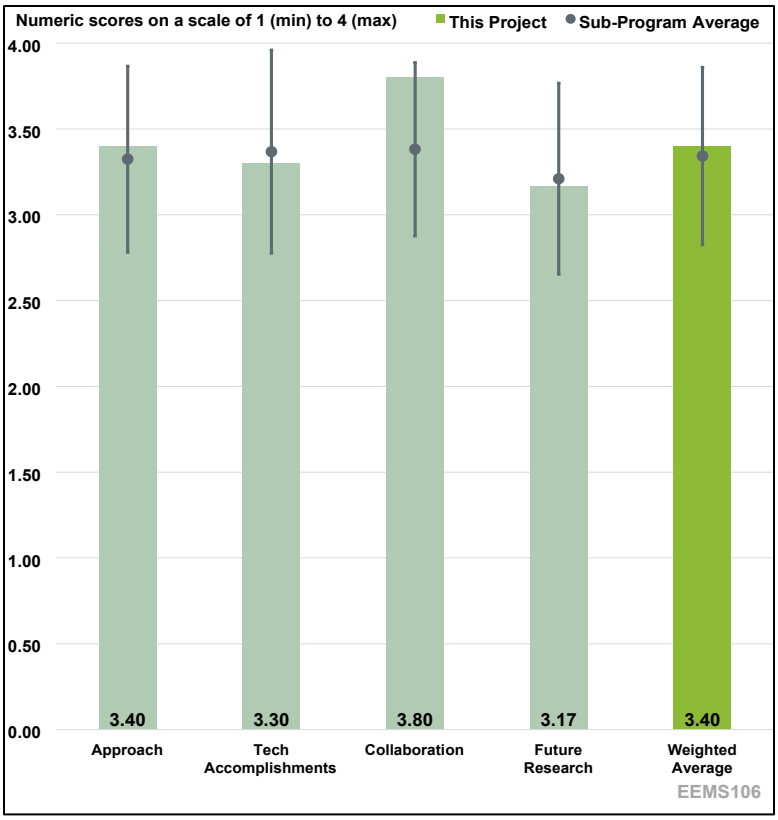

Figure 4-16. Presentation Number: EEMS106 Presentation Title: Developing an Energy-Conscious Traffic Signal Control System for Optimized Fuel Consumption in Connected Vehicle Environments Principal Investigator: Mina Sartipi, University of Tennessee Chattanooga

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer remarked that using a real-time digital twin, the project developed and implemented an adaptive signal control algorithm to reduce energy consumption and improve travel performance on a selected “smart corridor” in Chattanooga. This project was completed, included theoretical development, and proceeded to testing in the field.

Reviewer 2

The reviewer said the project execution was on schedule and addressed identified barriers.

Reviewer 3

The reviewer appreciated that the work was focused on the near term (i.e., it uses vehicle occupancy, vehicle count, speed, and signal state, which are all data that can be collected with technology available today). However, the reviewer suggested that it would be interesting in the future to see this work paired with automation and how much fuel and energy consumption could be saved. Slide 10 suggests that, in simulation, the team achieved their goal of reducing Eco_PI by 20% (reduced by 21.37%). The reviewer commented that it would have been helpful as part of the

presentation to discuss intuitively what the Eco_PI performance metric is capturing to ensure it is capturing reductions in fuel consumption and GHG emissions and is the right performance metric. The reviewer further questioned if, for the hardware-in-the-loop integration, was the integration of the decentralized graph-based multi-agent reinforcement learning (DGMARL) algorithm into the traffic signal control algorithm the only test, or was it also tested to validate that the algorithm achieved the reduction in Eco_PI that was observed in the simulation? The reviewer asked for clarification about how the car-following behavior in the VISSIM simulation was calibrated. The reviewer advised that research efforts have shown that using default values and calibrating using speed and count data like recommended in the "Traffic Analysis Toolbox" can still result in wildly inaccurate trajectories. The reviewer suggested that if the car-following model has unrealistic acceleration/deceleration data, this will likely impact the Eco_PI and the goal of achieving field results within 5%of the simulation results.

Reviewer 4

The reviewer explained that the researchers met or are meeting the barriers identified, by coordinating single simulation across multiple research groups and sharing data and results. The research team demonstrated the potential for integration of Eco-ATCS in traffic controllers under real-world conditions. Given the technical challenges and barriers identified, it was necessary for the researchers to prioritize the work they did, including development of the digital twin and establishment of baseline data, however, to understand the full potential for Eco-ATCS in traffic controllers (and signalization in general) to contribute substantially to energy efficiency gains in real-world contexts, it will be necessary for future work to focus on different kinds of conditions, impacts of connectivity to other vehicles, signals, and vulnerable road-users (VRUs), and accounting for human factors in response (e.g. travel demand induced by shorter travel times, the degree of behavioral adherence to vehicle prompts, etc.).

Reviewer 5

The reviewer explained that there was some confusion between the information provided and the project title. The project description and plans did not show anything related to a connected vehicle environment. The reviewer continued that there are a few discussions regarding using cameras to track vehicles but, it is not clear if that is offered as an equivalent of receiving vehicle battery management system messages. The reviewer observed that in several slides, the traffic measurement is volume. The reviewer did compliment the handling of the barriers involving the integration of the optimization system and the field controllers.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer stated that according to Slide 2 and 4, the project is 90%complete and on-target to finish at the end of this month.

Reviewer 2

The reviewer commented that field-testing of adaptive control is actually very difficult. This project brought the work to a field test where a reduction in CO_2 emissions and an improvement in travel measures were both demonstrated.

Reviewer 3

The reviewer observed that the overall objectives are well-defined, and the project is working toward meeting the objectives. However, the reviewer was concerned that the project is not clear on

addressing “Develop a multi-modal priority system” which has “A flexible priority system ready to accommodate transit priority and vulnerable road users (VRU).” Eco_PI is overly complex and therefore not clear and difficult to port to other applications and or consider other vehicle types. The reviewer suggested that a simpler energy and time optimization would seem to be sufficient. Slide 15 gives three energy/CO_2 metrics that seem to be the same savings at 3.54%. The reviewer questioned what different scenarios with different modal priorities look like.

Reviewer 4

The reviewer observed that the researchers have made substantial progress on the research plan. However, given the project end date in June 2024, it is critical that the researchers focus on ensuring that they complete the field-testing and demonstrate the fuel consumption/GHG emissions impacts, as this is the bottom line of the project. The reviewer continued that the contribution of this work to overcoming the barriers listed and meeting EEMS goals is dependent on the analysis of the energy and emissions consequences of the simulation. Thus, the success of the project requires completion of these critical steps. Similarly, the planned final report should elaborate on these results and articulate the conditions under which the simulations demonstrate the potential for Eco-ATCS technologies for reductions in energy consumption and GHG emissions.

Reviewer 5

The reviewer expressed concern that it is not clear how the full objectives of the project can be accomplished if the progress described in the presentation is by the end of April 2024. The presentation had only superficial information regarding how vehicle movements will be captured and how they are fed into the proposed system. The reviewer continued that the example photos provided on the subject show a variety of video surveillance methods, some of which are not realistic for a permanent field deployment. The above has clearly been accomplished in a simulation environment, so the proof of concept is accomplished. The reviewer agreed that it is conceivable that the technical details of integrating with the field hardware can be accomplished by June 2024.

Question 3: Please comment on 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?

Reviewer 1

The reviewer commented that the research demonstrated an impressive level of coordination and collaboration across several universities, research groups and a National Lab, all making significant technical contributions to the research. This work demonstrates the potential for researchers across institutions to work together on a unified project. The reviewer suggested that the unique contribution opens up opportunities for the research team to communicate some lessons learned and/or best practices for this kind of contribution in the final report or venues for communication about the project.

Reviewer 2

The reviewer complimented the leveraging the resources available at ORNL to perform “software-in-the-loop” and “hardware-in-the-loop” prior to testing this in the field. The collaboration with the City of Chattanooga was commended by the reviewer as it was observed that, it is critical to bring city and State Departments of Transportation and Metropolitan planning organizations to the table to address concerns about deployment that may not be initially acknowledged. Additionally, this gives opportunities to see and experience the technology, and hopefully encourages the implementation of other locations where this algorithm can be deployed.

Reviewer 3
The reviewer stated that the project successfully involved multiple research universities, ORNL, and a municipal government.

Reviewer 4
The reviewer agreed that the project was an overall great collaboration.

Reviewer 5
The reviewer agreed that the project teams seem to have very good collaboration going on. The reviewer commented that the project effort division takes into account each team's strengths and expertise. However, the reviewer expressed that the role of the ORNL is not clearly defined in the presentation. The reviewer understands that the PIs introduced a real vehicle on a dynamometer, but the measurement of the fuel consumption seems not to be accomplished with the current funding or under the current timeline.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1
The reviewer remarked that the future work for this project could make important contributions, and most notably, help move this work closer to commercialization and use in the real world. To ensure that future work answers critical questions about the applicability and potential of this technology, it will be important for future work to test the Eco-ATCS use in the field and under a variety of conditions. Additional data and scenario testing will be critical, especially to inform further understanding of the degree of energy and emissions savings that occur from use of the technologies in real-world conditions (different vehicles, street designs, environmental conditions, traffic conditions, etc.).

Reviewer 2
The reviewer stated that the project was ending in June 2024.

Reviewer 3
The reviewer said that the project is nearing completion.

Reviewer 4
The reviewer pointed out that the project is ending very soon.

Reviewer 5
The reviewer observed that there was a lot of future work discussed in the presentation which covers almost the entire effort of field-testing the system. However, the reviewer also commented that given that the project ends in June 2024, it might be difficult to be accomplished without substantially more funds and time.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1
The reviewer articulated that the EEMS Program envisions an affordable, efficient, safe, and accessible transportation future in which mobility is decoupled from energy consumption. The reviewer continued that this project explored how a different signal control algorithm (DGMARL), which can be calibrated using technology available to deploy by infrastructure owners and operators

(IOO) today, can be utilized to reduce Eco-PI (a measure of fuel and energy consumption) expended by human drivers. The reviewer heartily agreed that this supports the EEMS program objectives.

Reviewer 2
The reviewer commented that many of the transportation system's performance problems are at traffic signals. The project demonstrated an operational improvement that can be further developed for commercialization.

Reviewer 3
The reviewer pointed out that the project addressed a key area of need and interest in urban corridor mobility and energy optimization.

Reviewer 4
The reviewer agreed that the approach taken in this project is realistic and practical. The reviewer noted that this is a solution with reasonable complexity, allowing it to evolve into a commercial application for traffic control.

Reviewer 5
The reviewer concurred that the project is relevant to EEMS scope. However, continued focus on the energy efficiency results will be critical for the remaining work and any future work to ensure the technologies and the research is informing EEMS focus.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1
The reviewer stated that the project's resources were sufficient to bring the algorithm to a successful field demonstration.

Reviewer 2
The reviewer agreed that the project is appropriately resourced.

Reviewer 3
The reviewer commented that the project was completed on time and on budget.

Reviewer 4
The reviewer expressed that the resources appeared adequate. The reviewer also noted that there is a great distribution of resources across institutions involved. The reviewer was interested in the degree to which this distribution of resources helped make the project and collaboration successful.

Reviewer 5
The reviewer observed that the resources were sufficient to complete the project but expressed concern about the project's time and funding. Although it seems that the project is running out of time, it is not clear if it runs out of money also.

Presentation Number: EEMS107
Presentation Title: Improving network-wide fuel economy and enabling traffic signal optimization using infrastructure and vehicle-based sensing and connectivity
Principal Investigator: Joshua Bittle, University of Alabama

Presenter

Joshua Bittle, University of Alabama

Reviewer Sample Size

A total of three reviewers evaluated this project.

Project Relevance and Resources

67% of reviewers felt that the project was relevant to current DOE objectives, 33% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 67% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 33% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

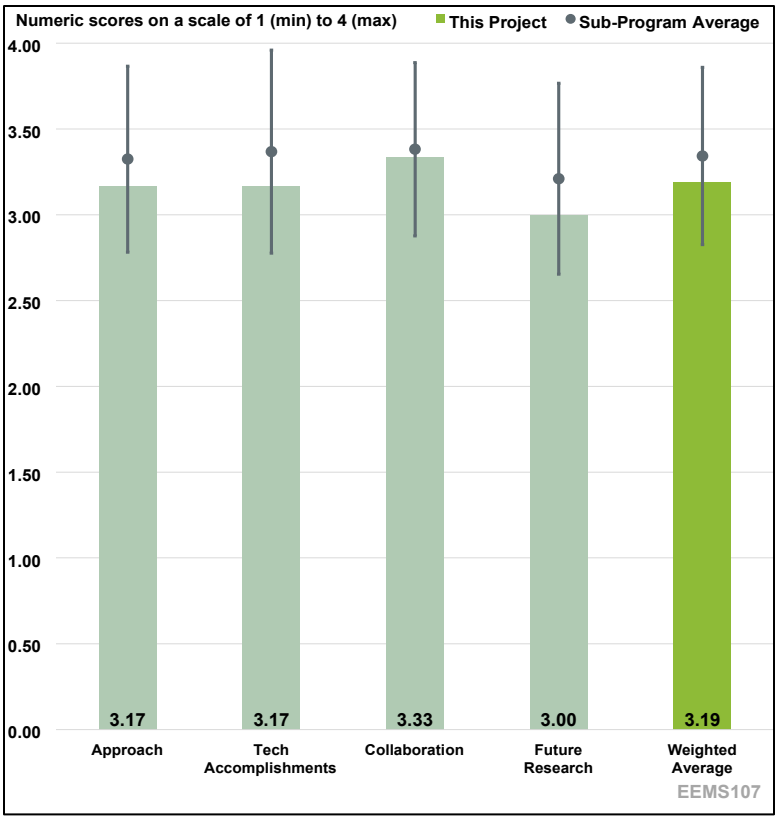

Figure 4-17. Presentation Number: EEMS107 Presentation Title: Improving network-wide fuel economy and enabling traffic signal optimization using infrastructure and vehicle-based sensing and connectivity Principal Investigator: Joshua Bittle, University of Alabama

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer praised the excellent job on the experiment design and the work done on data processing/sensor fusion and calibration over the last year. The insights into parameter sensitivity are extremely insightful. It absolutely makes the case to explore “truck signal priority” on arterial routes with high human-driven vehicle (HV) penetration rates (similar to transit signal priority) in the immediate term while we wait for IOOs to sufficiently deploy C-V2X and gain additional benefits. The reviewer expressed the hope that the work done to create well calibrated simulation models will pay off with the project team’s ability to achieve similar results in real world deployments.

Reviewer 2

The reviewer stated that overall, this was an excellent project specifically working to quantify the benefits of active traffic management with varying levels of CAVs.

Reviewer 3

The reviewer observed that the biggest barrier was the instrumentation of the three intersections and the processing of the data to produce vehicle trajectories. The reviewer then questioned why so

much effort was put into this part of the project, since the rest of the project was conducted purely in a simulation environment. The reviewer suggested that calibrating a simple microsimulation like Simulation of Urban Mobility with high resolution vehicle trajectories is unnecessary. The reviewer did not consider this project well-designed, or the execution timeline reasonably planned. The reviewer noted a large part of the effort involved the interface of the hardware-in-the-loop part at ORNL, and did not see how the 95% of the project funds being expended on this part without results produced is justified.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer commented that the project is on-budget and on-schedule for completion.

Reviewer 2

The reviewer explained that the project has made significant achievements in the implementation of in-field perception and data analysis of vehicle tracking applicable for input to the traffic controller optimization. Traffic optimization shows promise and the importance of priority of class eight truck energy consumption over other vehicles. However, the reviewer expressed concerns that the project was not clear about the connection to the individual vehicle optimization as part of this project and its contribution and what powertrain optimization is being done. The reviewer questioned if real-world scenarios with traffic and queuing constraints will be assessed?

Reviewer 3

The reviewer observed that marginal new knowledge was produced in this effort. The reviewer expressed concerns that for a project of this magnitude to just produce three simulation experiments with at least two of them using traditional traffic signal control methodologies, spending nearly $2 million is overkill for three intersections. At least from the material available for this review, the rest of the effort (sensor fusion, hardware-in-the-loop) was not essential or did not produce any actual results. The reviewer noted that, specifically in the results shown on Slide 20, the time space diagram contains some peculiar elements. The red intervals in the Federal Communications Commission (FCC) case indicate substantial cross traffic on these signals, yet the truck speed priority solution is allowed to substantially reduce these phases and the delays and fuel consumption from those vehicles stuck for several minutes on the side roads does not seem to affect the results. The reviewer suggested that the FCC control plan over constricted the mainline directions, basically making it a very easy baseline to improve from.

Question 3: Please comment on 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?

Reviewer 1

The reviewer commended the project for bringing the Alabama Department of Transportation (ALDOT) in as part of the project team. The reviewer observed that the research team worked closely with them to understand the challenges with deploying the data collection technology in the field and worked with them to address implementation barriers at other future sites The Federal Motor Carrier Safety Administration may be interested in this type of project in the future, because they are interested in promoting connectivity to commercial vehicles through talking about safety benefits. Based on the modeling observations (that the best thing we can do for fuel efficiency is not

stop heavy vehicles). The reviewer questions if this might be another way to promote connectivity to commercial trucking companies.

Reviewer 2
The reviewer comments that the work with the Alabama Department of Transportation and the City of Tuscaloosa was a great partnership.

Reviewer 3
The reviewer stated the project seems to have had good collaborations between teams although some of the efforts did not seem to be necessary.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1
The reviewer commented to be looking forward to seeing the results of the real-world demonstration.

Reviewer 2
The reviewer said that the project is wrapping up this month.

Reviewer 3
The reviewer is concerned that there seems to be a lot of things left over for the future unless the last two months of this project produced a lot of work. From Slide 23 it seems that real-world demonstration is unlikely to happen in the current project.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1
The reviewer directly pointed out that Slide 2 states, “from USDRIVE Vehicle-Mobility Systems Analysis Roadmap, this project directly supports goals of: estimating fuel savings potential in future connected transportation scenarios and management, demonstrating the potential for real-time data collection and system modeling, and evaluating AI and ML approaches for traffic and vehicle control.”

Reviewer 2
The reviewer stated that the project addressed the impact of mixed mode traffic including heavy trucks in urban corridors.

Reviewer 3
The reviewer did not see the progress in this project to be capable of advancing the Vehicle Transportation Office (VTO) objectives. The reviewer continues that the proposed solution does not involve the advanced connectivity technologies the VTO targeted for this research program.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1
The reviewer confirmed that the project was able to achieve objectives with the budget provided.

Reviewer 2
The reviewer remarked that the resources are appropriate for the project with respect to signal optimization. However, it is not clear whether resources for single vehicle optimization were appropriate, as limited results were shown.

Reviewer 3

The reviewer commented that for the critical parts of this project accomplished, the budget was excessive. It was the reviewer's opinion that there was a lot of effort spent on parts not seen as necessary to reach the same conclusions.

Presentation Number: EEMS108
Presentation Title: Co-Optimization of Vehicles and Routes
Principal Investigator: Nick Hertlein, PACCAR

Presenter

Nick Hertlein, PACCAR

Reviewer Sample Size

A total of three reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

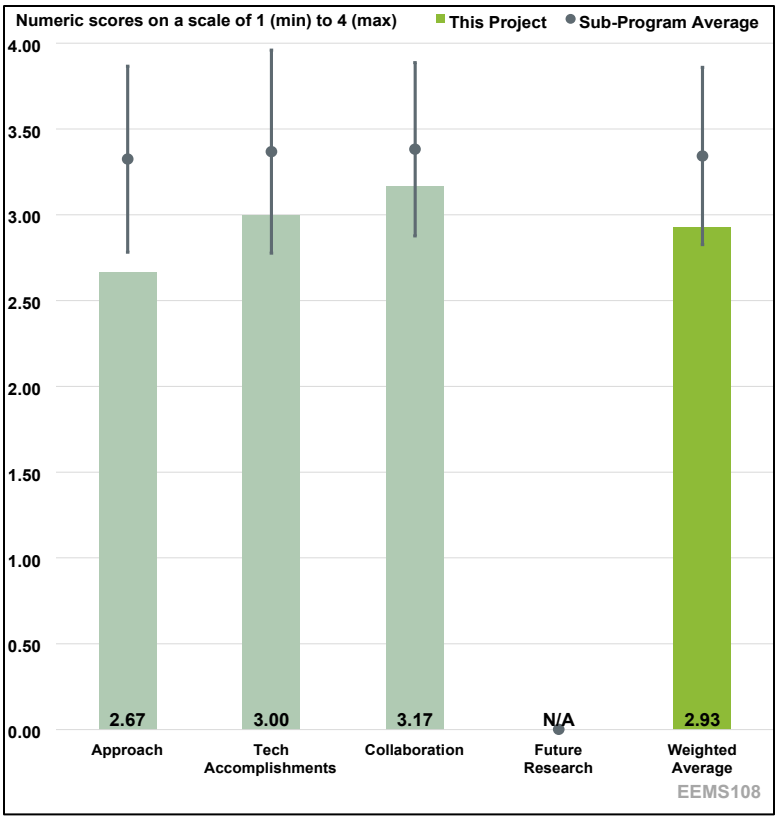

Figure 4-18. Presentation Number: EEMS108 Presentation Title: Co-Optimization of Vehicles and Routes Principal Investigator: Nick Hertlein, PACCAR

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer stated that the approach to performing the work is good.

Reviewer 2

The reviewer commented that the technical barriers appear to have been addressed. The project is well-designed for research and prototype. However, the project did not offer a business model to aid implementation.

Reviewer 3

The reviewer suggested that more time should have been planned for data analysis and organizing results. One quarter at the end of the project is currently labeled for data analysis and this is identified in the no-cost time extension period (annual quarter two, 2024). The reviewer further suggested that it would be more effective to start the analysis in annual quarter four of 2023 and cut the testing and validation period by one quarter.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer stated that the tech accomplishments are good.

Reviewer 2
The reviewer agreed that the technical accomplishments appear to be addressed. However, the project does not describe how powertrain adjustments are made or bandwidth limitations and mitigation.

Reviewer 3
The reviewer commented that the demonstration of the improvement of processes and tools to implement freight efficiency was well documented. However, results of the freight efficiency improvement metrics were unclear even though the briefing reported no remaining barriers, and the project is ending in annual quarter two (June 2024), which is the end of the extension period, not the original project period. The reviewer concluded that even if briefing time constraints were a concern with showing results or preliminary results, they could have been provided in the backup slides and were not.

Question 3: Please comment on 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?

Reviewer 1
The reviewer agreed that good coordination and allocation of skills and tasks between Kenworth, the NREL, Ohio State University, Kopas, and Esri.

Reviewer 2
The reviewer noted that collaboration between teams is good.

Reviewer 3
The reviewer observed that the partners have a significant role in the project's development success. The reviewer noted, however, that the partner's roles and products are critical to the entire system, which could be an issue moving forward. The reviewer stated that it would be nice to hear from them about their perspectives on adoption.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1
The reviewer noted that the project is complete.

Reviewer 2
The reviewer said that the research is considered complete and technology transfer and business development are next.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1
The reviewer expressed that the project supports the VTO goals of promoting electrification and reducing emissions.

Reviewer 2
The reviewer suggested that the relevance would be demonstrated further with feedback from fleet owners with regard to cost viability and practicality.

Reviewer 3

The reviewer commented that the analysis of freight efficiency and results was light in the briefing, but the demonstration of the composite weight function on Slide 11 for energy cost and driver time for determining the optimal route is beneficial.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer stated that the resources were adequate.

Reviewer 2

The reviewer commented that yes, the resources are sufficient for the project to achieve the stated milestones in a timely fashion.

Reviewer 3

The reviewer said that the funding, timeline, scope, and team appear sufficient.

Presentation Number: EEMS109
Presentation Title: Connected and Learning Based Optimal Freight Management for Efficiency
Principal Investigator: Ali Borhan, Cummins

Presenter

Ali Borhan, Cummins

Reviewer Sample Size

A total of three reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

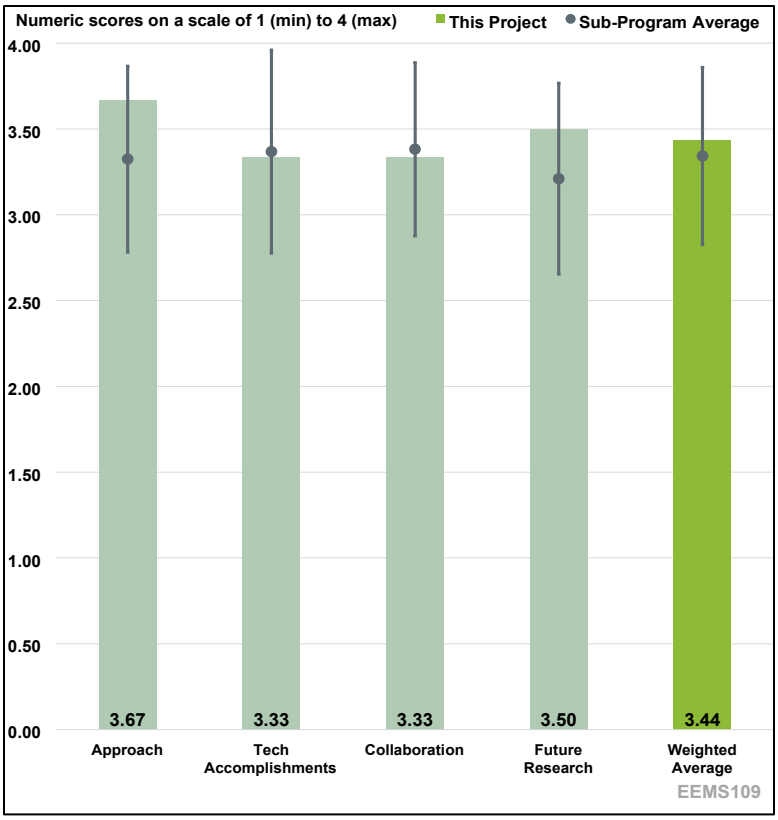

Figure 4-19. Presentation Number: EEMS109 Presentation Title: Connected and Learning Based Optimal Freight Management for Efficiency Principal Investigator: Ali Borhan, Cummins

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer noted that this project created an evaluation tool for electrical vehicles versus diesels with the potential for use in other alternatives. The reviewer commended the approach that Cummins Inc. took to the problem using real data where possible and believed it could be the start of additional funding.

Reviewer 2

The reviewer agreed that the project was well executed and met its stated goals. The barriers of development of a software that demonstrated the target carbon emissions reductions, based on field and simulation data, were clearly met, using evidence-backed inputs with results presented clearly. Even though the project is completed, the reviewer expressed the hope that the researchers are able to get a few refereed papers out of the research, to ensure its findings are shared broadly and visible to the scientific community, as well as continue to share its findings broadly.

Reviewer 3

The reviewer articulated that the project is addressing barriers faced by the fleet owners to optimize their fleets to reduce GHG emissions, including both capital expenditure and operational expense decisions. The development of software to allow fleet owners to optimize the fleet is critical.

However, the reviewer commented that it is not clear how the rolling resistance characterization (RRC) work is integrated into the entire project. A better story of weaving that work would have been beneficial.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer commented that the researchers have made impressive progress in completing the project. The inclusion of real-world technical inputs, development of the software, tire characterization inputs, and AI applications make for a robust and important contribution to our understanding of the potential for battery EV deployment for freight truck fleet operations.

Reviewer 2

The reviewer commented that this is a big project to help the industry through a transformation. Transformations, by definition, are extremely hard and generally underestimated. This is an impressive start.

Reviewer 3

The reviewer confirmed that the project deliverables aligned well with the project plans. However, it was noted that it would have been beneficial to see more discussion about technology deployment barriers and how to address them. The reviewer suggested that it would make the project much richer by further connecting RRC work with this project. The project also lacks details on wider deployment of the technology.

Question 3: Please comment on 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?

Reviewer 1

The reviewer commented that the project was well executed in terms of the partnerships and collaboration across team members. The inclusion of Michelin for tire characterization, as well as National Lab expertise to ensure real-world relevance and leveraging of needed technical expertise, have made for a robust study with relevant findings for real-world deployment of battery EV technologies in HD freight operations.

Reviewer 2

The reviewer stated that there was not enough evidence of how the collaborations worked except for the ORNL piece, which was significant.

Reviewer 3

Although the reviewer agreed that the project had good collaboration and partnerships, it was also noted that the project missed out on laying out a path for how to deploy this technology more widely and with different manufacturers and fleet owners and operators.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer suggested that more funding from DOE with the intention of a commercially viable consulting solution would be good, although the project is now closed.

Reviewer 2

The reviewer did not have any comment regarding the proposed future research, but hoped, the researchers continue to share and apply the study findings.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer remarked that the study is extremely relevant and responsive to EEMS objectives, as it evaluated and made important contributions to the understanding of the energy efficiency of battery electric vehicle technologies for the commercial freight trucking sector.

Reviewer 2

The reviewer observed that GHG emission reductions from freight or heavy goods vehicles is an area of concern, and this research is essential for advancing this mission's goal of reducing GHG emissions from the trucking sector. The project has demonstrated quantitative CO_2 efficiencies.

Reviewer 3

The reviewer agreed that the project was very relevant in helping fleets and others navigate these new technologies.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer stated that the researchers produced a robust study with the resources available. The work conducted is commensurate with the level of resources involved.

Reviewer 2

The reviewer stated that the resources of the project seemed sufficient.

Reviewer 3

The reviewer suggested that funds and discussions about technology deployment on a wider scale would be beneficial.

Presentation Number: EEMS110
Presentation Title: Human Factors and Technologies Design to Improve User Acceptance of Pooled Rideshare (PR) for Increasing Transportation System Energy Efficiency
Principal Investigator: Yunyi Jia, Clemson University

Presenter

Yunyi Jia, Clemson University

Reviewer Sample Size

A total of four reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

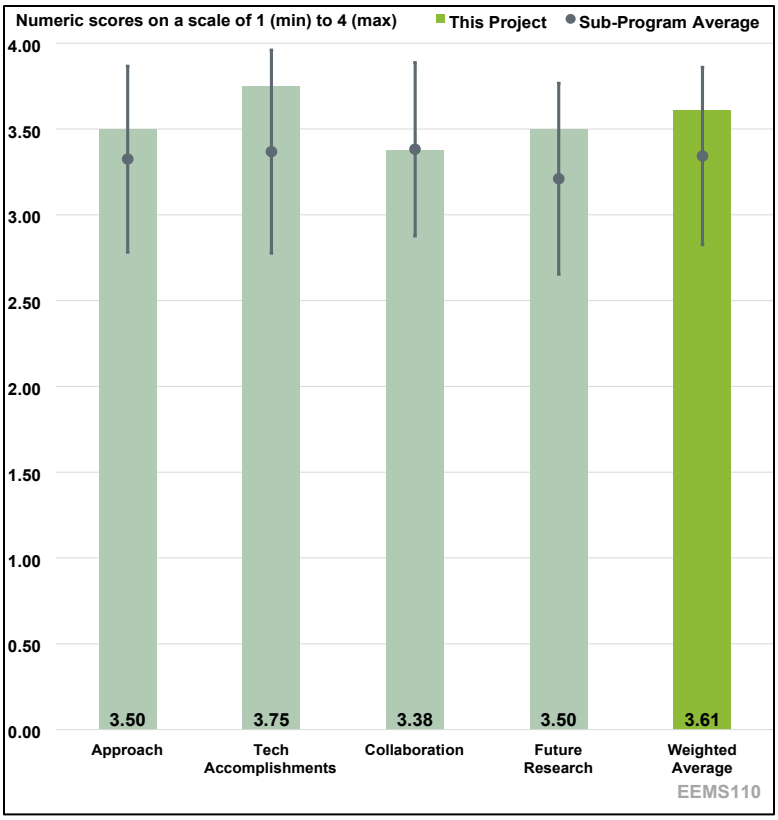

Figure 4-20. Presentation Number: EEMS110 Presentation Title: Human Factors and Technologies Design to Improve User Acceptance of Pooled Rideshare (PR) for Increasing Transportation System Energy Efficiency Principal Investigator: Yunyi Jia, Clemson University

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer evaluated the study as well-designed and expressed confidence that it will address the stated barriers. The reviewer continued that the research appears to be on track in terms of the timeline, especially given that the project team had been conducting evaluation and validation of the pooled rideshare (PR) use for the duration of the full study period. In Budget Period (BP) 3, it will be important for the researchers to focus on gathering adequate data to analyze the impact of the technology application on pooled-ride share use. This assessment of the impact of the optimization will be critical to fully understand the opportunity for energy efficiency presented by accounting for human factors in choosing rideshare.

Reviewer 2

The reviewer concluded that the purpose of the project is to improve the understanding of the circumstances under which individuals will accept PR. Then, based on that understanding, the project models PR use in different scenarios in order to guide technology design in such a way that encourages PR. The project results were presented to Uber, increasing the likelihood that they could influence the presence of PR, which is ultimately the goal. However, in order to assess the external

validity of these human factor findings, a field test of the design innovations proposed by the survey and model was suggested.

Reviewer 3

The reviewer expressed that the approach is logical and the most significant factor variables are identified, though it is unclear how this data was obtained to feed the models.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer confirmed that the data gathered was effectively used to develop and partially validate the models. The reviewer also noted that system components were integrated for optimization.

Reviewer 2

The reviewer commented that the researchers have made significant progress in completing surveys, developing the tools and collecting data. The reviewer also added that to ensure the project team takes full advantage of this progress, it will be critical for the researchers to continue to collect and analyze data on the outcomes in this last budget year.

Reviewer 3

The reviewer observed that the team has achieved, at least in part, all of its goals; data was collected on PR through user studies, modeled PR usage, guided technology design, and the team has begun validating the technology design recommendations.

Question 3: Please comment on 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?

Reviewer 1

The reviewer verified that the partnerships are adequate given the scope of the study and limited number of key stakeholders. The cooperation with Ford and J.D. Power is helpful for ensuring a strong technical backing. The reviewer commended that the Transportation Research Board (TRB) presentation yielded interest from Uber in the research. The reviewer noted that from the presentation, the PI noted that some of the work will not be able to be made public since private sector rideshare companies will not share their data and hoped that the researchers are at least able to share at a high-level useful and actionable information about the effectiveness of the interventions at increasing the proportion of users who choose PRs, where possible.

Reviewer 2

The reviewer stated that the roles of the partners were recognized and described. These partners contributions will be vital to technology demonstration and transfer to the public or private sectors.

Reviewer 3

The reviewer noted that the survey was conducted in collaboration with J.D. Power. The team also ensured that the behavioral results are being incorporated into other relevant EEMS projects to maximize the impact of the work. However, the reviewer also mentioned that it is unclear how the project team is collaborating among themselves.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer commented that the proposed future work of a new national survey, new refinement of the model, and integration into POLARIS will be important contributions to ensuring the study is robust and maximally actionable for potential uses. The reviewer continued that given the reduction in PR being an option in many apps, an important opportunity for future research on this study will be to communicate the energy efficiency consequences of pooled share not being available to many rideshare users across the country. If the researchers are able to clearly convey the findings in an accessible way, linked to the energy or emissions impacts, and what opportunities or nudges might enable more PR availability and preferences, this would be an important contribution of this work to climate and transportation discourse. The reviewer suggested that one additional opportunity, considering the limited outlook for PR options in the near future in the U.S., is for the researchers to consider the extent to which the finding on human factors, preferences, and demographics, might be applicable to other kinds of trip choices. The reviewer explored the question, “do the moderators identified provide any insights about how decisions about transit, micromobility, and active transport infrastructure and design might make mode shift to more energy efficient modes more incentivized for users,” and commented that if the researchers are able to extrapolate any insights beyond PR, the results could be a useful contribution beyond the specific goals of the study.

Reviewer 2

The reviewer observed that the project shows the intent to further integrate the models in order to validate overall performance and energy savings improvements.

Reviewer 3

The reviewer agreed that the routing and repositioning algorithms make sense as a next step, as does evaluating the performance of the designs by incorporating them into the POLARIS. However, surveys are simply not sufficient to predict real-world behavior. The reviewer suggested that in order to truly understand whether the insights from this study will increase PR use, the researchers must conduct a more externally valid experiment, ideally in partnership with a company that offers a rideshare service.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer commented that this study is extremely relevant to EEMS, given the potential and documented impact of pooled ride share verses individual ride share trips on energy use. The reviewer continued that it will be important for the research to clearly convey the energy efficiency consequences of PR (and lack thereof) as well as insights from the surveys and modeling that informs what factors encourage or discourage PR preferences.

Reviewer 2

The reviewer stated that the project is relevant to EEMS, because it helps elucidate how rideshare (a commonly used mode of transportation) can be made more efficient.

Reviewer 3

The reviewer remarked there should be a maybe option, and said the project does not appear to be showing the energy advantage ratio that is perceived to be at an advantage to current rideshare or traditional taxi services and there could be more focus on energy.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer commented that this is a highly complex project with reliance on the partners to provide development and data sourcing support and further resources are likely needed to fully accomplish the project goals.

Reviewer 2

The reviewer said the researchers appear to be conducting a significant amount of social science methods research for a fairly modest amount of resources. This is impressive, given the time intensity of the survey and the research design of this study. The reviewer said an impressive amount of work was done here.

Reviewer 3

The reviewer agreed that the project has made the intended progress in the allotted time frame.

Presentation Number: EEMS112
Presentation Title: NREL Core Modeling & Decision Support Capabilities (RouteE FASTSim OpenPATH T3CO)
Principal Investigator: Jeff Gonder, National Renewable Energy Laboratory

Presenter

Jeff Gonder, National Renewable Energy Laboratory

Reviewer Sample Size

A total of five reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

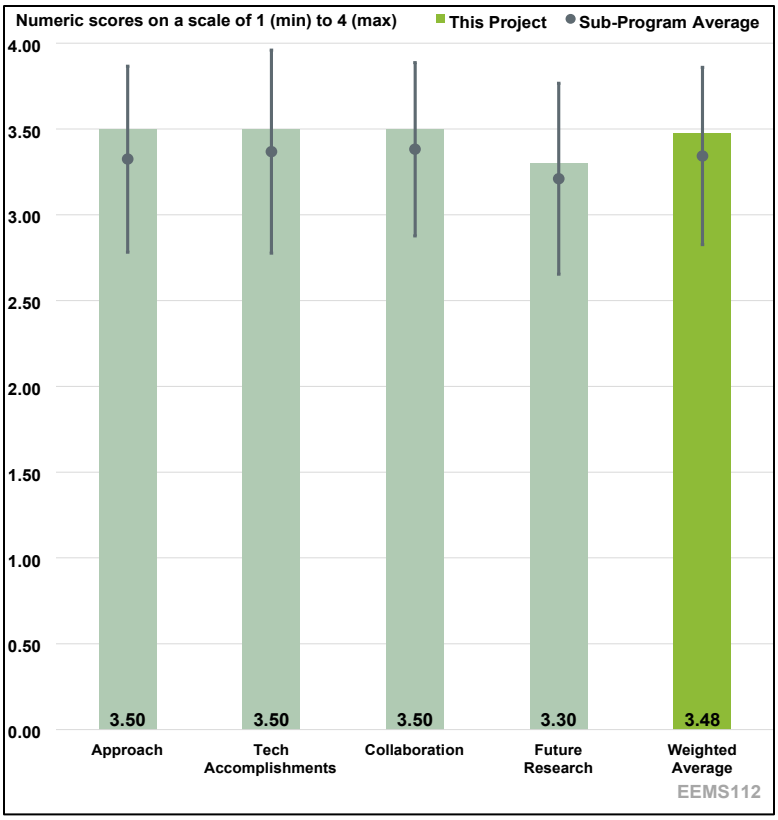

Figure 4-21. Presentation Number: EEMS112 Presentation Title: NREL Core Modeling & Decision Support Capabilities (RouteE FASTSim OpenPATH T3CO) Principal Investigator: Jeff Gonder, National Renewable Energy Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer commented that the ability to expand the data sources with the understanding of the difficulties related to uncertainty and inconsistency with how it is generated is being addressed to the extent reasonable. The reviewer commented that identifying the most significant factors moving forward to aid in improving practicality will be a challenge.

Reviewer 2

The reviewer observed that adding greater complexity to the existing light-duty and HD capabilities versus adding new capabilities for analyzing other sectors (i.e., non-road), are both important. The reviewer added that from a timing perspective, prioritizing non-road development seems more important.

Reviewer 3

The reviewer agreed that the project design is good.

Reviewer 4

The reviewer commented that the maintenance, updating, and expansion of data analysis and software tools of this type is not flashy but, it is vital to help make lots of work useful to a much broader audience and drive impacts. The reviewer added that the approach to the work, getting regular input from stakeholders, expanding partnerships and awareness of the tools, and just updating the codes to run more efficiently and handle more and better data, is vital to keeping the tools relevant and increase the awareness of them. The project team's approach, which varies specifically for each tool and what that tool is intended to do, is very strong. The reviewer suggested that the project team thinks bigger, such as: what more could the project team do with more support, who would that impact, and who would be inclined to support this work because of that?

Reviewer 5

The reviewer noted that there is a widespread hypothesis that better dashboards and real-time, visually appealing metrics are both motivating and desirable for individuals and groups or cohorts for engaging in sustainability-oriented behaviors—both for making it easier to know what can be done to make a difference and to make it easier to see that they have made a difference individually and as part of the larger cohort. For transportation-oriented tools, intended to support real-time decision-making, a hand-held tool such as a smartphone app is ideal. The reviewer pointed out that one of the chief difficulties associated with testing this hypothesis is the cost and difficulty of developing such tools to test. The reviewer concluded that the project is delivering astonishing high-quality visuals in this regard, tied to very sophisticated underlying analytics.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer commended the project team's list of technical accomplishments of the tools, in terms of capabilities added and use achieved is very strong and stated the team did excellent work.

Reviewer 2

The reviewer applauded the outstanding progress in the implementation of updates to transportation technology total cost of ownership (T3CO) and FASTSIM, and growing the user base across a critical cross-section of government, regulatory agencies and research.

Reviewer 3

The reviewer remarked that the effort of reducing the burden of users and therefore improving the likelihood of adoption is impressive, as is the quantification of many different data sources from collaborators. There is a reasonable effort to look forward as to how emerging technologies might influence the outcome of the research, which is hard given the limited time and budget and uncertainty as to how things will develop. The reviewer continued that effort in demonstrating and convincing collaboration from industry is key to project success and provides valuable insight into technical direction for the research.

Reviewer 4

The reviewer stated that the project seems to be making good progress and to be on track. However, the reviewer commented that the information as presented, makes it difficult to know how functional the app under development is at this time. There are three categories of progress needed for this project: develop meaningful analytics, develop a seamless and easy-to-use interface, and test it with users to refine it in a co-design process. As presented, there has been most progress on developing meaningful analytics and developing a seamless and easy-to-use interface, perhaps

none yet on testing it with users to refine in a co-design process. Plans for how to test these tools are not clearly stated and are explicitly needed.

Reviewer 5

The reviewer commented that many barriers have been overcome or, at least, with some assumptions, are overcome. There are several moving pieces and so those assumptions are reasonable.

Question 3: Please comment on 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?

Reviewer 1

The reviewer remarked that the list of partnerships and collaborations the team showed reads like an ideal wish list for any program of this type, in terms of length and diversity of collaborators. The reviewer was impressed with the level and breadth of interest and use these tools have generated. The reviewer suggested to continue work on this path, leveraging partnerships to get input on how to improve the tools and add useful data that can be added to the tools.

Reviewer 2

The reviewer commented that considering the wide range of tools that have been developed for various purposes by different people over the years, it is an impressive effort to integrate toward a larger goal and to have the foresight to use the attributes that are most influential toward the goal while leaving some behind. The reviewer noted that this demonstrated strong internal coordination. The partnerships with fleet operators operating in different conditions is a real strength for demonstrating the range of application of the research, while also creating greater exposure to the research effort and potential.

Reviewer 3

The reviewer remarked that the project showed excellent and appropriate collaboration, leading to a tangible impact on government and industry-wide decarbonization programs.

Reviewer 4

The reviewer said that several partners and players were involved, but the project was well-coordinated.

Reviewer 5

The reviewer commented that there is insufficient information provided to be able to review this component, which is a very important part of this project and needs more explanation going forward.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer commented that the project is exciting and offers a rare opportunity to develop and test out a sophisticated smartphone app that could put some novel tools in people’s hands. Plans for future research seem appropriate and well-aligned, and a high priority should be placed on carefully designing the following elements drawn directly from the slides; improve user engagement, implement additional gamification and personalized dashboard features, support more sophisticated automated analyses, integrate with MEP or other travel behavior analyzes tools, partnering critical to maximize impacts, build upon current successes by establishing new collaborative applications for the tools.

Reviewer 2
The reviewer stated that the project team provided a clear vision of how to build upon the accomplishments of the work so far with demonstrated understanding of the potential outcomes and benefits. The reviewer believed that the project will be more likely to succeed it the partnerships can be maintained and expanded.

Reviewer 3
The reviewer observed that the future work is clearly defined and achievable, but going forward, expanding non-road data and analytical capabilities will be an important area of growth.

Reviewer 4
The reviewer suggested that while improving the user dashboard is great, but investing more on finding additional use cases and reaching out even further would be better. The reviewer also said that adding new features based on potential new uses cases of the tool would be a plus.

Reviewer 5
The reviewer agreed that the proposed future research is in line with past and current success. Given the high quality and impact of success so far, the proposed future is likely to continue the great track record. However, the reviewer recommends the research team think larger about potential impacts, the work necessary to achieve that impact, and additional partners (including possible funders, in-kind contributors) that could be gained to accomplish that work.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1
The reviewer stated that the project is relevant to EEMS and Analysis.

Reviewer 2
The reviewer agreed that the project supports the overall Vehicle Transportation Office's Energy Efficiency Mobility System objectives. The project supports the maintenance and improvement of tools that help interested entities (companies, city governments, interest groups, etc.) better understand new impacts on traffic and resource usage that new transportation technologies can have. This helps drive adoption and realize the great possibilities that new transportation technologies can enable.

Reviewer 3
The reviewer commented that the project is more likely to be adopted consistently by organizations and companies with fleets where there is some consistency and incentive for making the investment than individual citizens. However, the potential to meet the VTO objectives is high.

Reviewer 4
The collaboration with the U.S. Environmental Protection Agency (Slide 14) establishes an important milestone in the relevance and importance of T3CO.

Reviewer 5
The reviewer observed that the technological relevance of this project is high, even if just as proof of concept. The actual relevance will be determined by user feedback and whether users use it. Those results are not going to be obtained until a later stage in the project. The reviewer continued that it is tempting to consider whether this delivery system can be utilized to support other tools that are being developed by various VTO programs.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer agreed that the project is sufficient.

Reviewer 2

The reviewer commented that, based on what has been presented, there seems to be good alignment between the project plan and the resources.

Reviewer 3

The reviewer said this is an issue less of whether the resources are sufficient, but what level and types of impacts you want to have. Fewer resources towards this project are still likely to have impacts, just fewer and slower. More resources seem very likely to increase and accelerate the positive impacts this project generates. So, it is more a question of “right sizing”.

Reviewer 4

The reviewer stated that considering the complexity of the project with regard to obtaining data in a manner that is consistent enough to feed the models and demonstrate reasonable outcomes in a short period of time, it seems that the resources are enough. However, this is only possible with the contributions of the collaborators.

Reviewer 5

The reviewer confirmed that the resources are substantial, and the success of the project suggests it is sufficient. The reviewer continued that the expansion of the user base and scope of the tools suggests that additional resources may be needed in subsequent fiscal years.

Presentation Number: EEMS113
Presentation Title: Testing and Evaluation of Curb Management and Integrated Strategies to Catalyze Market Adoption of Electric Vehicles
Principal Investigator: Lauren Harper, LACI

Presenter

Lauren Harper, LACI

Reviewer Sample Size

A total of five reviewers evaluated this project.

Project Relevance and Resources

80% of reviewers felt that the project was relevant to current DOE objectives, 20% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

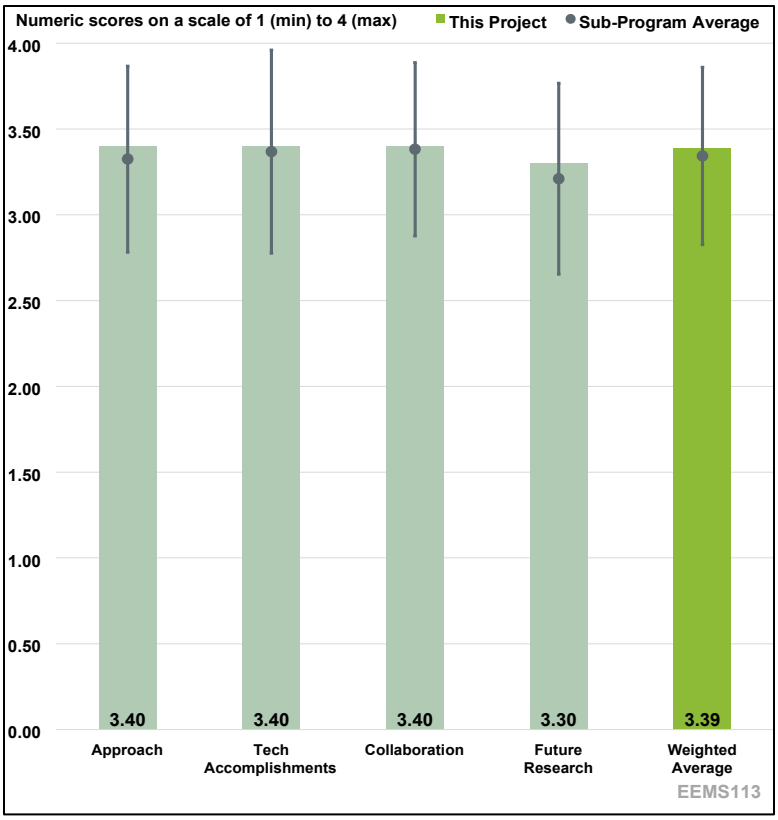

Figure 4-22. Presentation Number: EEMS113 Presentation Title: Testing and Evaluation of Curb Management and Integrated Strategies to Catalyze Market Adoption of Electric Vehicles Principal Investigator: Lauren Harper, LACI

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer explained that the project has an excellent approach with four main key points: to manage traffic congestion, build accurate models, compare the three cities modeling and best practices, and support policy change. To address the difficulty managing traffic congestion and enforcement in last mile and rideshare, the team has developed and is testing simulated and real-world intervention models to support EV adoption. To compare and evaluate strategies, the team is analyzing intervention implications and outcomes, incorporating feedback and new data, adjusting the models, and providing recommendations to cities. To support policy alignment on surveillance law related to data collection, enforcement, mail-based ticketing within cities, the project will inform the final roadmap for policymakers and other city governments.

Reviewer 2

The reviewer agreed that the project is well-designed, and the timeline is reasonably planned.

Reviewer 3
The reviewer expressed that the project team seems to have a good grasp of the barriers and have designed the project well. The timeline so far, had only minor adjustments, so for now it looks feasible.

Reviewer 4
The reviewer articulated that the project addresses curb congestion and related emissions and productivity losses by modeling and testing enforceable policy solutions. The design aims to leverage previous research and simulation modeling to understand how different policies would influence energy use and emissions (2023-2024). Finally, automated enforcement policies are being evaluated in several cities (2024-2025). There is evidence that the policy decreases double-parking and increases traffic flow.

Reviewer 5
The reviewer commented that this project seemed to lack focus and deliverables and was confused during the first review.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1
The reviewer agreed that the team has achieved all the milestones intended to be achieved by the 2024 review period, such as the model development and deployment and the beginning of the policy implementation in cities. The team has published six papers from their work so far.

Reviewer 2
The reviewer stated that the technical progress is good relative to the project plan.

Reviewer 3
The reviewer remarked that the target technical accomplishments had been made in all three locations. The Pittsburgh project has influenced policy changes in the city parking codes along with enforcement. The Santa Monica and Los Angeles projects have both moved, and it is likely that Santa Monica will follow Los Angeles in policy changes. Los Angeles also has increased to 11 sites, with 30 more considerations.

Reviewer 4
The reviewer affirmed that this is a multifaceted project that involves a lot of entities from the public sector. For now, it looks like the proposed approach is progressing in a satisfactory manner and it is accepted by the infrastructure owners.

Reviewer 5
The reviewer expressed concerns that the compliance seemed to be the goal and progress was confusing. The reviewer also noted the project team skipped around with examples in different geographies.

Question 3: Please comment on 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?

Reviewer 1
The reviewer stated that the collaboration across the team is excellent. However, the lack of a transportation stakeholder with current last mile delivery data, future plans on equipment and

delivery methods are lacking. The reviewer suggested that the team needs a transportation stakeholder with delivery industrial engineering acumen.

Reviewer 2
The reviewer confirmed that the collaboration across teams is good.

Reviewer 3
This reviewer remarked that this is an extremely complex and challenging collaborative project, and it would not be possible without extremely effective coordination among researchers, policymakers, and technology providers.

Reviewer 4
The reviewer observed that it is difficult to keep public sector entities excited and delivering tasks, especially policy-related actions, reliably and on time. The project has encountered some difficulties, but for the most part, nothing yet that would put a doubt on the effectiveness of these partnerships.

Reviewer 5
The reviewer commented that the project seemed ok but was unsure of each companies' deliverables.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1
The reviewer expressed that the future work is clear and valuable, but it also seems to be quite extensive for the remaining time available in the project. In addition to conducting stakeholder data gathering and measuring the success of policy deployment, the team also proposes to develop resources to support EV adoption among delivery drivers, refine models and data frameworks, and implement the automated license plate reader technology in new contexts. The team has to address its ongoing implementation challenges, such as connecting with Technology Network Company drivers.

Reviewer 2
The reviewer stated that the proposed next steps are satisfactory.

Reviewer 3
The reviewer listed that the future research includes modeling for mesoscopic and microscopic scopes with the team laboratories, continuing to scale Smart and Zero Emission Loading Zones in Pittsburgh and Los Angeles, and hosting listening sessions with drivers and fleet managers and test interventions and scenarios in the models.

Reviewer 4
The reviewer explained that the plan is still unfolding, and no major or unsurmountable issues have been reported.

Reviewer 5
The reviewer commented that there was confusion about exactly what else was to be done.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer stated that the project aims to increase efficiency in mobility systems by improving traffic flow, EV adoption, and equity.

Reviewer 2

The reviewer agreed that the project supports overall VTO objectives of clean, efficient transportation.

Reviewer 3

The reviewer confirmed that the research is very relevant to the adoption of EVs. With this research there can be an accurate model and plans to follow to reduce emissions and improve mobility.

Reviewer 4

The reviewer commented that the project generates real world progress. Only a few of such projects exist, so the work is needed and commendable.

Reviewer 5

The reviewer was not sure on the relevance of the project supporting overall VTO subprogram objectives.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer confirmed that resources appear to be sufficient for stated objectives.

Reviewer 2

The reviewer agreed that the resources are sufficient for the current team and stakeholders.

Reviewer 3

The reviewer said that the project is accomplishing its goals within budget and on time with a six-month extension.

Reviewer 4

The reviewer claimed that the project seemed sufficient but had a confusing scope and deliverables.

Reviewer 5

The reviewer noted that the project has a large budget. The reviewer observed that from the provided material it seems that a lot of city-wide systems are purchased, but how much are these costs to the project and how much are in-kind matching is unclear.

Presentation Number: EEMS114
Presentation Title: Real Twin
Principal Investigator: Ross Wang, Oak Ridge National Laboratory

Presenter

Ross Wang, Oak Ridge National Laboratory

Reviewer Sample Size

A total of four reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

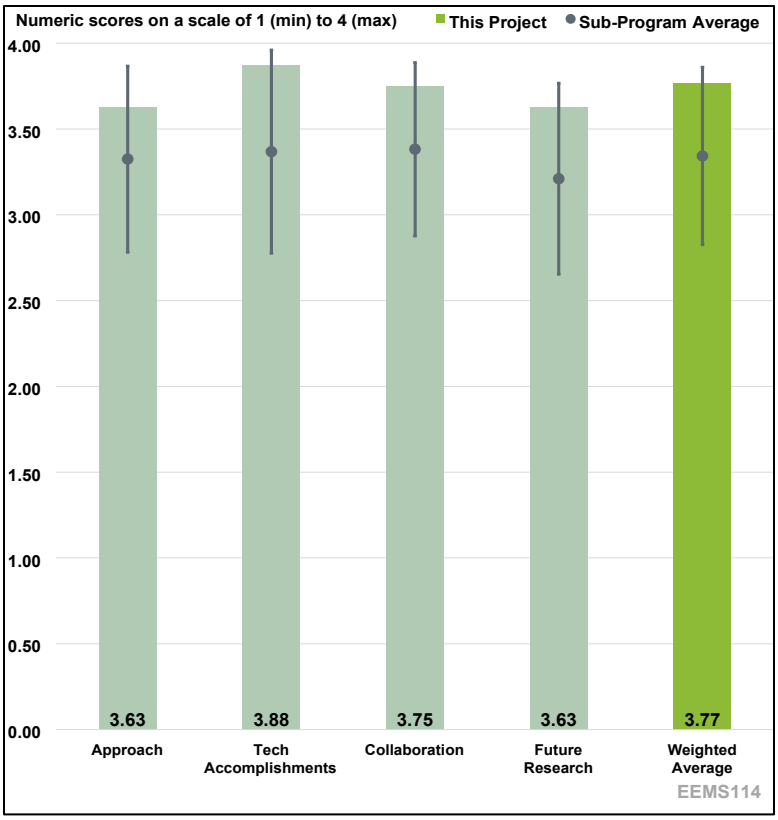

Figure 4-23. Presentation Number: EEMS114 Presentation Title: Real Twin Principal Investigator: Ross Wang, Oak Ridge National Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer stated that the proposed approach to the problem looks great, in proper sequences to develop workflows, scenario generation tools and connecting them to exercise.

Reviewer 2

The reviewer agreed that the project proposed a unified, model agnostic scenario generation capability that is important to evaluate different energy and environment related strategies using the same and identical scenarios.

Reviewer 3

The reviewer noted that Slides 6-15 represented a well-thought-out approach to implementing the proposed project and did not have further suggestions of what to do differently.

Reviewer 4

The reviewer observed that the project approach is consistent with the overall goals and with overcoming the technical barriers identified. The challenge of creating consistent input files or "scenarios" across different software products with different internal models and algorithms is very difficult. However, it is noted that while an exact translation of scenarios is probably not feasible (for

any approach) due to some underlying differences in the internal models and parameters embedded in the tools, the approach taken by the team seems to be sound.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer stated that all proposed milestones are met based on the timeline as proposed and expressed excitement about the idea of Real-Twin with hopes seeing successful finalization.

Reviewer 2

The reviewer said that the project is well-designed and could support scenario generation and calibration (semi-automated) which streamline the testing process.

Reviewer 3

The reviewer agreed that the project is making great progress compared to the project plan and is on track to finish in December 2024.

Reviewer 4

The reviewer observed that the project team is making successful progress. The reviewer also noted that there may never be a perfect translation of scenarios from disparate tools, but the project team seems to be making strides in greatly reducing the level of effort required for researchers to develop "equivalent" scenarios across different tools.

Question 3: Please comment on 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?

Reviewer 1

The reviewer stated that the project is interconnected with other EEMS projects and supports multiple projects in the field. Various stakeholders are supporting the project well, which seems very positive.

Reviewer 2

The reviewer said that the project is well collaborated with technical partners to complete target tasks.

Reviewer 3

The reviewer explained that the project is well coordinated across a diverse set of stakeholders, including universities, federal agencies, simulation tools developers, the DOE, OEMs, and local agencies.

Reviewer 4

The reviewer commented that although there are not really project partners, there are many project stakeholders that the team is coordinating and collaborating with. The stakeholders include representatives of other DOE projects, OEMs, and the DOT.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer remarked that the plans for future research have been presented in detail, and how to connect with other EEMS projects. The reviewer looks forward to seeing the case study results in the future.

Reviewer 2
The reviewer said that the proposed future research is solid.

Reviewer 3
The reviewer stated that the project team has a strong approach to how they will wrap up the last six months of the project. Additionally, the reviewer expressed deep appreciation for the semi-automated calibration method chosen to be in alignment with the traffic analysis tool (TAT) and commented that this will help significantly with getting the method adopted by practice. The reviewer asked if the project team used the original method or the updated 2019 methodology, due to a lack of a citation to check in the slides. The reviewer continued that the FHWA has learned is that it makes a really big difference if you are using traditional data (e.g., counts, flow, travel time) or trajectory data for microsimulation model calibration. In work completed by FHWA, it was found that for a model calibrated using the TAT methodology, a model can be "well-calibrated" according to typical performance metrics. However, the trajectories are less accurate than if default parameter values had been used. The inverse was true if only trajectories were used for calibration (the more macroscopic performance measures suffered significantly in accuracy). FHWA found that a hybrid calibration method using both types of data resulted in the most accurate performance metrics, using holdout data for validation. The reviewer noted that given the DOE focus on emissions (which are extremely sensitive to acceleration/deceleration behavior), it might be worth using trajectory data as an additional calibration dataset in the future, such as from FHWA research on this topic.

Reviewer 4
The reviewer commented that the team will continue to work on the transferability of simulation scenarios across tools, such as extending the scope of the parameters and settings to include advanced simulation settings and agent behavior. The reviewer added that the plan for outreach for this scenario tool to make it available to all researchers, not just DOE sponsored researchers, is not totally clear.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1
The reviewer agreed that the project aligns perfectly with what the VTO and EEMS programs aim to achieve.

Reviewer 2
The reviewer stated that the project covers the VTO objectives: Analysis and EEMS.

Reviewer 3
The reviewer confirmed that the project is very supportive of EEMS goals by developing a tool that strives to create consistency in the evaluation of connected vehicle applications and also reduces the level of effort required to develop consistent scenarios across different analysis and simulation software packages.

Reviewer 4
The reviewer explained that simulation is one of the best ways to better understand what the impacts could be when there are significant uncertainties (e.g., automation). However, because the simulation is so sensitive to the assumptions in the underlying scenario, it makes it very challenging to compare across projects/simulations (e.g., apples to oranges... or drastically different results, so much so that there are limited insights that can be drawn). The reviewer agreed that the project

keeps delivering a unified scenario generation capability that is model agnostic and ensures consistent scenario simulation across different microsimulation platforms, making it easier to various projects to work together and build on one another. This is a significant contribution to the field and seems EEMS program objectives (as simulation is necessary to understand what methods help to decouple carbon from increased mobility opportunities).

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer commented that the project seems to have sufficient resources within the team and has solid support from stakeholders.

Reviewer 2

The reviewer said that the project has sufficient resources.

Reviewer 3

The reviewer agreed that the project is on-track to be completed on-time and on-budget, indicating that resources are appropriate.

Reviewer 4

The reviewer stated that the resources appear to be sufficient to complete the work.

Presentation Number: EEMS115
Presentation Title: Modeling Connected and Automated (CAV) Compute Power
Principal Investigator: Ben Feinberg, Sandia National Laboratories

Presenter

Ben Feinberg, Sandia National Laboratories

Reviewer Sample Size

A total of four reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

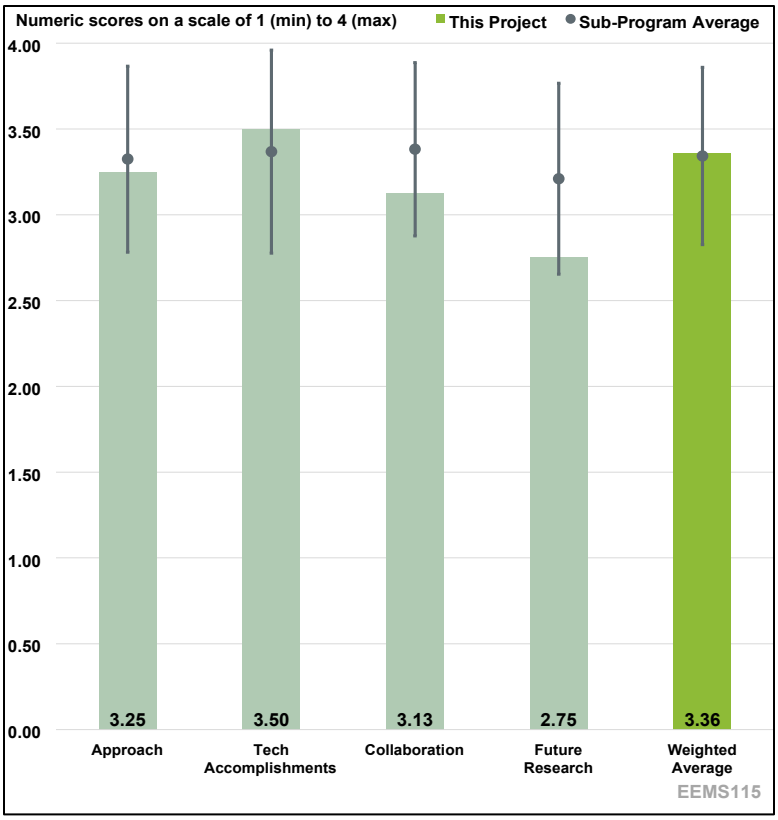

Figure 4-24. Presentation Number: EEMS115 Presentation Title: Modeling Connected and Automated (CAV) Compute Power Principal Investigator: Ben Feinberg, Sandia National Laboratories

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer stated that the approach to solving the problem seems properly planned, starting from defining workload, scheduling workloads, generating energy-consuming events from the schedules, and validating end-to-end processing latency.

Reviewer 2

The reviewer remarked that the project is complete, and the timeline is not relevant. However, it is also expressed that it is not exactly clear where or to whom this tool will be useful, but Sandia's role in managing the project between key collaborators will be important in clarifying the problem statement and need for a tool.

Reviewer 3

The reviewer stated that there was no constructive feedback on the approach and congratulated the project team on successfully completing the project in March 2024.

Reviewer 4

The reviewer was not sure of the assessment of the second barrier “Revisit and expand the traditional systems engineering ‘V Diagram’ to consider vehicle operational environment,” and how this project is addressing this particular barrier.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer confirmed that the technical progress in developing the analysis is impressive, although limited in scope.

Reviewer 2

The reviewer said that the proposed all milestones were met within the given timeline.

Reviewer 3

The reviewer confirmed that according to the Slide 4, all milestones on the project plan were met prior to the completion of the project.

Reviewer 4

The reviewer commented that it is difficult to assess the provided results as vehicle energy consumption is complex compared to figures on Slide 3, which uses a constant 300Wh/mile. It would be very helpful to capture and categorize power and energy costs for sensing, perception, etc.

Question 3: Please comment on 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?

Reviewer 1

The reviewer agreed that the collaboration with The United States Council for Automotive Research is a good start, but broadening the collaboration in future efforts to include vehicle-to-infrastructure (V2I) providers, in addition to OEMs and Tier 1s, will be important to evaluate onboard versus offboard computational sensing and computational loads.

Reviewer 2

The reviewer observed that there is ample opportunity to collaborate across the EEMS community; the researcher should consider if this project would continue.

Reviewer 3

The reviewer stated that the team showed excellent collaboration through monthly meetings with the working group and continuing work.

Reviewer 4

The reviewer expressed that the collaboration seems limited.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer observed that according to the Slide 4, all milestones on the project plan were met prior to the completion of the project.

Reviewer 2

The reviewer said that no further research is planned because it is the end of the project.

Reviewer 3

The reviewer observed that according to the Slide 4, all milestones on the project plan were met prior to the completion of the project.

Reviewer 4

The reviewer stated that the project has ended.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer agreed that the project aligns well with the VTO and EEMS, focusing on computation power distribution to enable autonomy efficiently.

Reviewer 2

The reviewer noted that in various forms, CAVs are an important part of future decarbonization strategies. The reviewer suggested that the development of the tool may be helpful in assessing tradeoffs of onboard and V2I systems.

Reviewer 3

The reviewer commented that parasitic energy consumption of CAVs need to be understood against their benefits for potential energy savings. Building up information on the compute energy is an important part of the overall energy consumption but should consider what is needed for advanced driver assistance system, automated vehicles versus automated vehicles with energy optimization.

Reviewer 4

The reviewer comments that EEMS Program envisions an affordable, efficient, safe, and accessible transportation future in which mobility is decoupled from energy consumption. The reviewer suggested that the presenter did not do a great job of communicating the bigger picture of why the project is important.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer stated that the project is complete.

Reviewer 2

The reviewer agreed that the resources are sufficient.

Reviewer 3

The reviewer stated that the project is accomplished successfully within the resources given to the team.

Reviewer 4

The reviewer commented that the project was able to achieve its objectives with the financial resources made available and is sufficient.

Presentation Number: EEMS116
Presentation Title: High-Quality Perception Data
Principal Investigator: Zach Asher, Western Michigan

Presenter

Zach Asher, Western Michigan

Reviewer Sample Size

A total of six reviewers evaluated this project.

Project Relevance and Resources

83% of reviewers felt that the project was relevant to current DOE objectives, 17% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 83% of reviewers felt that the resources were sufficient, 17% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

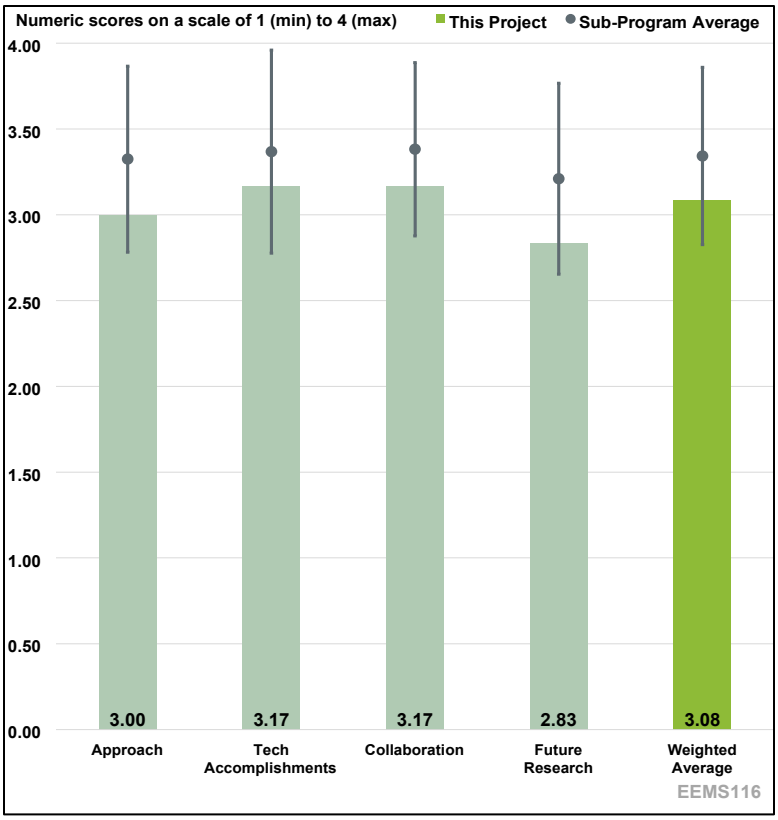

Figure 4-25. Presentation Number: EEMS116 Presentation Title: High-Quality Perception Data Principal Investigator: Zach Asher, Western Michigan

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer said the work is excellent and provides interesting perspectives on sensing and perception factors in CAVs.

Reviewer 2

The reviewer commended the project for being well thought through and well-designed but cautioned that the timeline for the remaining work seems a bit ambitious. The reviewer commented that the project will help further the safety of the vehicles while reducing online computing and sensor loads. The reviewer said the future is heading in the direction of having intelligent/sensor embedded infrastructure and this project will help further the critical understanding. The reviewer concluded the per vehicle load savings might be modest, but collectively they will add up.

Reviewer 3

According to the reviewer, the project is well designed overall, and the timeline is reasonably planned. The reviewer added that results (energy impact) will be highly dependent on driving/environmental scenarios modeled. The reviewer finished by stating that greater detail on scenario definition, probability and energy impact would enable a better understanding of overall energy impact of technology implementation.

Reviewer 4

The reviewer summarized that the project is developing several early-stage infrastructure-based sensor technologies, and the project has a sound work plan to investigate and develop all technologies. The reviewer noted that most of the project milestones have been met, and the project is set to conclude at the end of the calendar year following on-road testing, engagement activities, and the completion of the final report. According to the reviewer, many technical barriers were addressed, and as the project was working to develop early-stage technology, more barriers were discovered. The reviewer noted that the project team does have plans to continue developing the most promising technologies studied; in particular, the Chip-Enabled Raised Pavement Markers (CERPMs) technology.

Reviewer 5

The reviewer acknowledged that the project encountered technical barriers that presented challenges for the team. The reviewer concluded by saying the team managed through some of the inherent limitations to detection in the on-road environment.

Reviewer 6

The reviewer stated barriers are presented as objectives without showing a link between them. The reviewer added if the goal is to reconfigure the existing technology within automated vehicles coupled with reliance on roadway infrastructure to achieve modest improvements in energy consumption, then the approach is reasonable; however, no experimental matrix is presented to assess overall success and draw statistically significant conclusions.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer commented that good progress has been made on evaluation of all proposed technologies. The reviewer suggested that consideration of reliance on existing sensors as a safety backup should be researched, and the possibility of incumbent sensors being removed or switched to a low power mode until needed and still fulfilling safety requirements should be evaluated and included in the overall energy impact.

Reviewer 2

The reviewer said the project is well executed and deliverables provided on planned dates but cautioned that the remainder of deliverables seem a bit ambitious in the timeline but doable. The reviewer stated the work further enhance use of CERPM, radar retro-reflectors (RRs), etc. and addresses the safety aspects. The reviewer concluded that this work is much needed as new and better on-board and infrastructure related sensor technologies continue to advance, and the results will increase awareness and quantification methodologies for estimating load savings.

Reviewer 3

The reviewer noted that the team made significant progress in developing the various sensor technologies included in the scope of this project. The reviewer listed key findings resulting from project work, including: 1) CERPMs shows great promise for lane line detection and can be affordable to implement. The project team is looking to commercialize this product through a Small Business Innovation Research (SBIR) funding opportunity. 2) Radar retroreflectors have been challenging to develop and require further study. 3) Existing weather sensors, for example, those at airports, work better than what could be purchased/implemented. 4) HD map data is promising when used in conjunction with other sensor types, but it seems that the quality of the data is crucial to its

success. The reviewer concluded while not all tested technologies will reach the target technology readiness level increases, this project did make significant progress in developing and testing the infrastructure-based sensor technologies.

Reviewer 4

The reviewer described the project's approaches to infrastructure sensor developments (e.g., CERPMs) as interesting, and noted that its applications extend beyond energy to safety and other factors.

Reviewer 5

The reviewer said the project has made expected progress compared to the project plan and is on track to complete the intended scope.

Reviewer 6

The reviewer concluded that there is not a project plan presented, but rather a table of milestones, so it appears that they are on track. The reviewer advised that deeper and more frequent stakeholder communications would be appreciated.

Question 3: Please comment on 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?

Reviewer 1

The reviewer commented the project appears to be well-coordinated, and collaboration efforts support the project's objectives.

Reviewer 2

The reviewer noted the project's good level of collaboration with partners and suggested that an additional collaboration with an automotive industry company would be beneficial. The reviewer explained that this would enable further context refinement and understanding of implementation barriers.

Reviewer 3

The reviewer noted the project has a good set of collaborators and well-rounded list of stakeholders, and that it is good to see a couple of State Departments of Transportation (DOTs) and mention of Metropolitan Planning Organizations (MPOs). The reviewer concluded it will be beneficial to see collaboration or partnership with U.S. DOT/(National Highway Traffic Safety Administration (NHTSA)/FHWA/Turner-Fairbank Highway Research Center (TFHRC), etc.

Reviewer 4

The reviewer commented the project team appeared to achieve their goals to collaborate with partners from industry and the national laboratories.

Reviewer 5

The reviewer commented the project could seek additional collaborations with OEMS/suppliers.

Reviewer 6

The reviewer said that collaboration within the project team is not described or demonstrated. The reviewer added that the collaborators are presented along with their roles.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer stated future work is essential and absolutely needed, and the plan is well defined. However, this reviewer noted the timeline seems a bit ambitious, but manageable. The reviewer expressed excitement for future work and suggested connecting with NHTSA and other U.S. DOT administrations.

Reviewer 2

The reviewer expressed that opportunities to commercialize some of the technologies seem promising.

Reviewer 3

The reviewer suggested future work should focus on defining scenarios for technology evaluation and scenario-based energy impact determination; The selection of one static route for analysis will not be comprehensive of the spectrum of energy impacts from technology implementation.

Reviewer 4

The reviewer commented that proposed future research will take place this calendar year and complete all project milestones, including on-road demonstrations and engagement activities. The reviewer asked if at this stage, the project team has considered how different types or sizes of vehicles (e.g., transit vehicles vs. personal vehicles) might interact with the sensors?

Reviewer 5

The reviewer observed that future work appears to finish what should have been accomplished in this project without an explanation of what the potential significance is anticipated to be. The reviewer finished by stating the targets are not listed.

Reviewer 6

The reviewer commented the project has defined their goals for future work, however, given the known technical challenges, there is uncertainty as to whether the future work would achieve its targets.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer noted the program supports the overall VTO subprogram objectives and directly addresses an area of automated driving energy use. The reviewer added that the program is unique in that it addresses low-cost infrastructure technologies.

Reviewer 2

The reviewer commented the project supports understanding and minimizing energy consumption for sensors and perception. The reviewer mentioned that weather has a significant impact on vehicle energy consumption and taking this information into account could be used in vehicle optimization.

Reviewer 3

The reviewer commended this project because it will help develop better transportation systems and continued by noting that sensors are becoming ubiquitous; research is needed on how best to utilize and best place them. The reviewer concluded the research will help designers and planners to see the benefits of incorporating sensors in infrastructure and using less on-board sensors.

Reviewer 4
The reviewer commented the project supports EEMS goals to improve energy efficiency of mobility systems because it seeks to improve energy efficiency of electric and automated vehicles.

Reviewer 5
The reviewer stated the project supports EEMS subprogram objectives.

Reviewer 6
The reviewer highlighted out the project's demonstration of incremental improvements to existing technology, even modest if demonstrated, but pointed out there is no acknowledgment human factors, a significant barrier.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1
The reviewer asserted the project is well funded.

Reviewer 2
The reviewer stated resources for this project are sufficient.

Reviewer 3
The reviewer noted the project is on track with existing resources.

Reviewer 4
The reviewer commented the resources are sufficient to achieve the stated milestones within the remaining project timeframe (by end of calendar year 2024).

Reviewer 5
The reviewer remarked resources appear to be sufficient and the remaining budget is sufficient to complete the project in a timely fashion.

Reviewer 6
The reviewer asserted the resources provided may be enough to integrate and demonstrate some efficiencies in the system, although demonstrating through field trials and fitting the infrastructure with sensors will itself consume the whole bank of time and money if done properly.

Presentation Number: EEMS117
Presentation Title: Visual-Enhanced Cooperative Traffic Operations (VECTOR) System
Principal Investigator: Achilleas Kourtellis, University of South Florida

Presenter

Xiaopeng Li, University of Wisconsin Madison

Reviewer Sample Size

A total of four reviewers evaluated this project.

Project Relevance and Resources

50% of reviewers felt that the project was relevant to current DOE objectives, 50% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 50% of reviewers felt that the resources were sufficient, 25% of reviewers felt that the resources were insufficient, 25% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

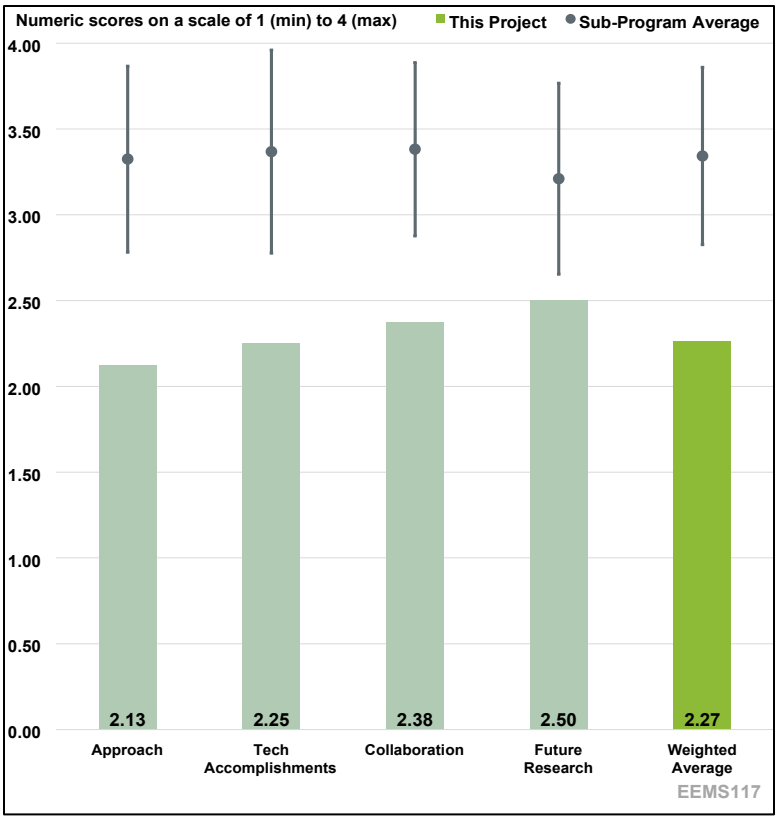

Figure 4-26. Presentation Number: EEMS117 Presentation Title: Visual-Enhanced Cooperative Traffic Operations (VECTOR) System Principal Investigator: Achilleas Kourtellis, University of South Florida

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer noted the project appears to be on the cusp of completing BP 1 tasks and beginning BP 2 (Slide 4 describes BP 1 go/no-go criteria, but did not clearly indicate if this had passed, though it appears to have done so). The reviewer continued by stating key modules in BP 1 appear to have progressed per the well-developed and detailed project plan. The reviewer added that this comment could also go into the Future Work session, but since the question asks to consider project design, the concerns will be raised here. Concerns for the project are noted: 1) The number of use cases five (5) is rather large, and much more detail needs to be given to assess the use cases. 2) In freeway corridors and urban arterials—the most straightforward of use cases, which scenarios will be tested? (lane changing, cut-offs, etc.). 3) “Multi-modal transportation” as a use case seems far too broad. 4) What are the specific aspects of rural corridors that make it unique compared to other use cases?

Reviewer 2
The reviewer stated the target of making improvements in cost and energy consumption of existing automated driving infrastructure is a low bar considering the larger barrier of human factors.

Reviewer 3
The reviewer asserted the project appears to have a number of modules/enablers that could each be project in isolation. The reviewer stated it is not clear how the modules interact and work together with a goal to achieving project objectives. The reviewer concluded the proposed impacts are very high, and it is unclear how the research corresponds to them.

Reviewer 4
The reviewer asserted that the decision to use light signals combined with cyclic redundancy check (CRC) encoders and decoders for vehicle-to-vehicle (V2V) communication must address the issues with significant attenuation by dirt on surfaces of the CRC encoders and decoders, inclement weather, dust storms, doppler effect, and other interferences, especially intervening vehicles and physical barriers (e.g., highway walls, tunnels, and bridges), as the reviewer thinks the reliability of the VECTOR system needs to be compared against wireless radio or microwave communication. The reviewer pointed out the use case of a rural scenario like Zion National Park, where there is no traffic congestion, and thus, no drastic need to improve energy efficiency could be justified further; another major shortfall is the lack of focus on safety.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1
The reviewer commented the project has made excellent progress. The reviewer noted the AI sensing module has achieved 99% accuracy but wondered if that will be good enough from a safety standpoint; although no standards have been established, and there is likely redundancy in the sensors, from a safety and regulatory perspective, 99% at first glance seems too low. The reviewer considered the significance of some of the improvements and explained reducing energy consumption of AI sensing is laudable, but when it is 100W system, at 8 hours of direct operation, that is still less than 1 kWhr, and the savings from the project get you to 0.64 Kahr. The reviewer concluded by asking if one assumes a 75 kWhr battery, how much does this really move the dial?

Reviewer 2
The reviewer commented the technical progress seems fair and suggested the project team might consider including the stakeholders much earlier, such as at the beginning of the project.

Reviewer 3
The reviewer asserted that, because it is not clear how the project plan will address the technical barriers, it does not appear that technical progress will actually deliver in solving these barriers. The reviewer added that the edge computing and control module appears to have the most critical role in delivering impact and addressing the technical barriers, but its development is lagging behind the other modules.

Reviewer 4
The reviewer commented the project plan provided neither target dates nor milestones and thus technical progress could not be determined.

Question 3: Please comment on 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?

Reviewer 1

The reviewer commented that the roles and responsibilities for each partner were not clearly communicated.

Reviewer 2

The reviewer observed there were no partners from the U.S DOT, especially from the Intelligent Transportation Systems Joint Program Office, which deals with CAVs or from the Volpe National Transportation Systems Center or from the FHWA.

Reviewer 3

The reviewer commented many partners are listed, but the contribution of each was unclear.

Reviewer 4

The reviewer stated that it's not clear what all of the partners are contributing to the project.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer commented from a broad perspective, the future work is aligned with project targets, but more specific deliverables and linking between tasks and the final objectives is necessary.

Reviewer 2

The reviewer asserted the proposed future research is satisfactory.

Reviewer 3

The reviewer expressed the cost of conducting the "use cases" does not appear to be realistic in comparison to the overall budget. The reviewer commented it is not yet determined how the other partners are expected to contribute to the effort, and finished by stating the extent of coordination, given uncertainties such as weather and other unforeseen events pose high risk of meeting goals in the given time frame.

Reviewer 4

The reviewer referred to prior comments.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer commended the project, and expressed excitement for seeing more results, particularly as it moves to field testing. The reviewer continued by saying since the DOT is also doing a considerable amount of CDA research and testing, coordinating and communicating with DOT should be important.

Reviewer 2

The reviewer stated if this were implemented on a national scale and all the vehicles were electric, perhaps some slight energy savings might be achieved.

Reviewer 3

The reviewer commented at high level, the VECTOR system supports overall VTO subprogram objectives; however, it is difficult to see how the project will tangibly deliver results.

Reviewer 4

The reviewer criticized the use of light for V2V communication instead of radio or microwave wireless communication.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer stated that the allocated resources are sufficient.

Reviewer 2

The reviewer stated that while the project has a lot of use cases, it is also at 39% spent, so it appears to be sufficiently resourced.

Reviewer 3

The reviewer commented that the design, implementation, execution, analysis and validation of just the “use-cases” could easily consume the budget.

Reviewer 4

The reviewer asserted $4.8 million is too much for this kind of work.

Presentation Number: EEMS118
Presentation Title: AI-Based Mobility Monitoring System and Analytics Demonstration Pilot
Principal Investigator: Scott Samuelson, University of California Irvine

Presenter

Blake Lane, University of California Irvine

Reviewer Sample Size

A total of three reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

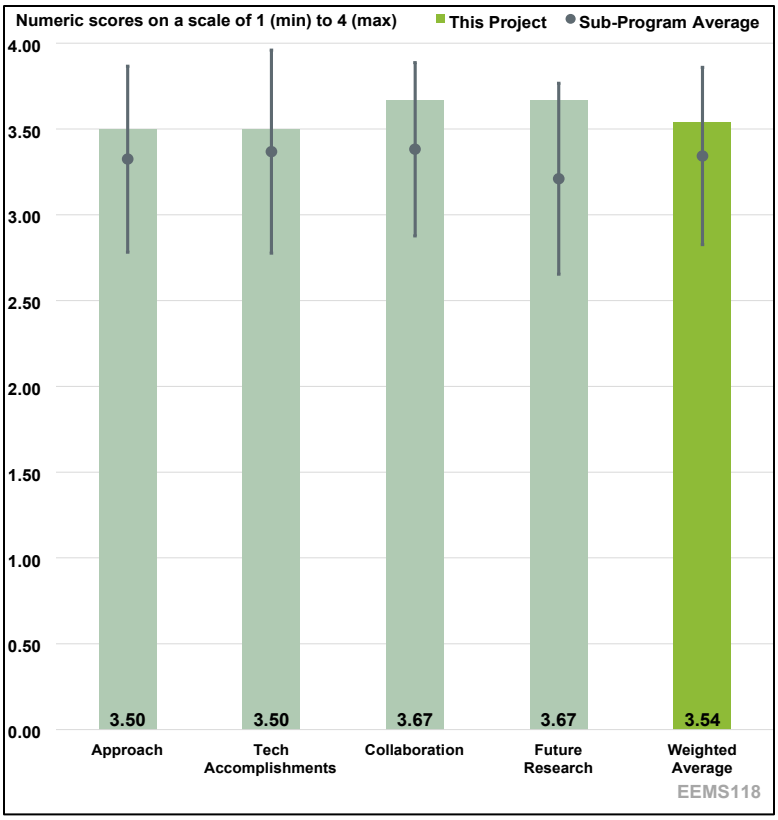

Figure 4-27. Presentation Number: EEMS118 Presentation Title: AI-Based Mobility Monitoring System and Analytics Demonstration Pilot Principal Investigator: Scott Samuelson, University of California Irvine

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer remarked that this is a great study scope and frame, and the fact that it allows for testing of different levels of CDA, and other scenarios is appreciated. The benefit of having a sample size of 25 intersections is noted, provided the overall traffic numbers and vulnerable road use numbers are substantial enough to provide adequate input for training the AI. The reviewer commented that in BP 3 and in communication of the results of this study, it will be important for the research to clarify the extent to which they are optimizing for energy efficiency vs. safety. The reviewer concluding by saying the proposal blends these objectives together in the presentation, but guiding the AI and driver assist recommendations toward safety or climate goals could yield different results—both could be interesting and useful, but the researchers should be clear about what is in scope.

Reviewer 2

The reviewer pointed out the project is not yet complete but has progressed to field testing. The reviewer commented the project has used an XIL-based approach to develop a connected-vehicle

approach to improving travel on roads with low to moderate traffic densities. The reviewer finished by saying the project has addressed both theoretical and field operations challenges.

Reviewer 3

The reviewer asserted the timeline is reasonable for what is expected to be accomplished without scale-up and vehicle automation. The reviewer stated that the project's approach from controlled traffic event creation, to CDA Simulation, to CDA XIL Testing, to Full Scale CDA Deployment, and lastly, to scale up in area and vehicle operation type, was well designed and expansive; however, expecting to deliver both scales of deployment in and across conventional HV App behavioral intervention and fully automated driving system (ADS) vehicle intervention was bold. The reviewer stated that progress in one of each vehicle and location is a sufficient advancement. The reviewer added that safety was identified as a key factor and reinforced by the community outreach findings, the metrics to measure if not intervene/react to findings in deployment or future scale-up are unclear. Understanding that sensor detection distance is a critical factor may have been predicted in earlier stages of the program. The reviewer said it appears the simulation and XIL testing included important assumptions about market penetration which is understandable, but appears to have excluded Light Detection and Ranging (LiDAR) based data of traffic information from a small/early deployment which would have provided an important input to activities in Period 1 or 2. The reviewer added that these testing results may have led to modification of deployment breadth (i.e., less intersections) by concentrating more instruments at fewer intersections (e.g., mid-block). The reviewer finished by suggesting this may be a recommendation based on the benefit of hindsight, and it should be considered as a recommendation for future simulation and XIL testing approaches and go/no-go gates in other projects.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer commented that excluding the stretch goals of increasing geographic scale and integration with ADS operated vehicles, the accomplishments of operating impacts to traffic and energy efficiency improvements, as well as identifying vehicle versus signal and combined impacts are excellent. The reviewer acknowledged that human behavioral modification and adherence are common confounds to CDA deployment, and the lack of clearly defined safety performance metrics for vehicle to vehicle and vehicle to pedestrian at intersections is an important gap to fill in the final months of the project.

Reviewer 2

The reviewer observed that the project has progressed to limited field testing for connected vehicles, and the project is now progressing to a metropolitan-scale analysis. The reviewer stated that, under the right conditions, the project is demonstrating emissions and travel condition improvements.

Reviewer 3

The reviewer commented that the researchers have made important progress in this study; however, it appears a lot of the work needed to address the barriers identified and there is less than a year left in Budget Year 3. The reviewer expressed it is important the researchers stay on track to address the barriers and get results by the end of the study period. The reviewer concluded by noting the data analysis, cost-benefit analysis, and agent-based model development are key outputs to address the barriers that are still to be complete.

Question 3: Please comment on 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?

Reviewer 1

The reviewer made note of good coordination and allocation of skills and tasks across partners. The reviewer made special note of recognizing the impacts to the community and seeking to educate and collect feedback on the planned traffic interventions.

Reviewer 2

The reviewer described collaboration on the technical elements as outstanding and highlighted good contributions and coordination between the academic researchers, municipalities, and regional decisionmakers. The reviewer did note, however, that it is less clear how the listening sessions and Saddleback Collage elements are playing a role in the research; in other words, it is unclear how this input is being incorporated into the research, if at all, or are these outreach events simply for educational purposes and not intended to feed into the research direct.

Reviewer 3

The reviewer summarized that the project effectively involves research universities, ANL, private firms, and two highway jurisdictions (a city and the university-UCI), but the project has also extended involvement to the larger metropolitan association of governments.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer noted that if completed, the future research proposed will accomplish the stated purpose and contribute substantially to overcoming the EEMS barriers stated. The reviewer expressed confidence that the researchers' contributions will meet the stated purpose and shed light on important future potential for energy benefits from CDA and AI systems. The reviewer noted the importance for the researchers to be clear to include the parameters of the findings in their findings. The reviewer provided that it could be an important contribution for the research to analyze the potential for use of these technologies under different scenarios and conditions (e.g. to what extent does this inform the potential for use of the technologies to improve safety? To increase energy efficiency? How well does the technology handle VRUs and under what conditions?)

Reviewer 2

The reviewer observed that the future work for the current project is focused mostly on effectuating the suggested speeds through either driver encouragement or an automated process. The reviewer expressed the importance of this step, excitement for the results, and curiosity, for future projects, in an analytical context, how changes in roadway geometry would change the results. The reviewer elaborated by asking two questions: 1) How does this system work with a three-lane vs. four-lane roadway cross section with the same traffic volume (say $12,000–$15,000), appropriate for a three-lane cross section, but often four or five lanes)? 2) Some of the challenges of passing vehicles may be solved with a three-lane section, but would the higher traffic density make the connected vehicle system less efficient? The reviewer emphasized that these are interesting questions for us because we are pursuing three-lane cross section alternatives to improve traffic safety.

Reviewer 3

The reviewer said remaining challenges were clearly identified and insightful, however, communication of risk mitigation plans due to signal distance detection limitations, impacts to safety,

driver behavioral adherence could be improved. The reviewer stated that there may be insufficient time to modify models due to signal detection and driver behavioral adherence and recommended defining the feedback loop for monitoring and safety management criteria where traffic intervention will be halted. The reviewer concluded by pointing out that causal relationships may be difficult to make with the traffic interventions, but the effort to identify safety management process would benefit this and future projects.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer said the project does support the EEMS scope and has the potential to provide important insights on energy efficiency impacts of deploying CDA and AI technologies—with the caveat stated above, and added that the authors need to clarify to what extent they are optimizing for energy efficiency vs. safety (or clarify if there is not meaningful distinction between these goals in terms of how the AI and driver assist suggestions operate).

Reviewer 2

The reviewer commented the outcomes of the project support advancement and knowledge in process, equipment, powertrain, mobility management, and components.

Reviewer 3

The reviewer pointed out that delay at traffic signals is a major element of transportation system inefficiencies, energy consumption, and GHG emissions.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer commented that resources appear to be sufficient to complete the project.

Reviewer 2

The reviewer commented that the resources seem sufficient; however, the reviewer thought it will be important for the researchers to be efficient in their work for the (short) remainder of the project, given the number of tasks not yet completed in budget year three (3) that are key contributions to the purpose of the study and given the significant amount of resources in FY24 ($2 million).

Reviewer 3

The reviewer stated the stretch goals for larger scale deployment and both human and automation operations may have been unnecessary scope.

Presentation Number: EEMS119
Presentation Title: Improved Mobility and Energy Savings Through Optimization of Cooperative Driving Automation (CDA) Application for Signal Controls for Arterial Mixed Traffic Scenarios
Principal Investigator: Xiao-Yun Lu, Lawrence Berkeley National Laboratory

Presenter

Hao Liu, Lawrence Berkeley National Laboratory

Reviewer Sample Size

A total of four reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

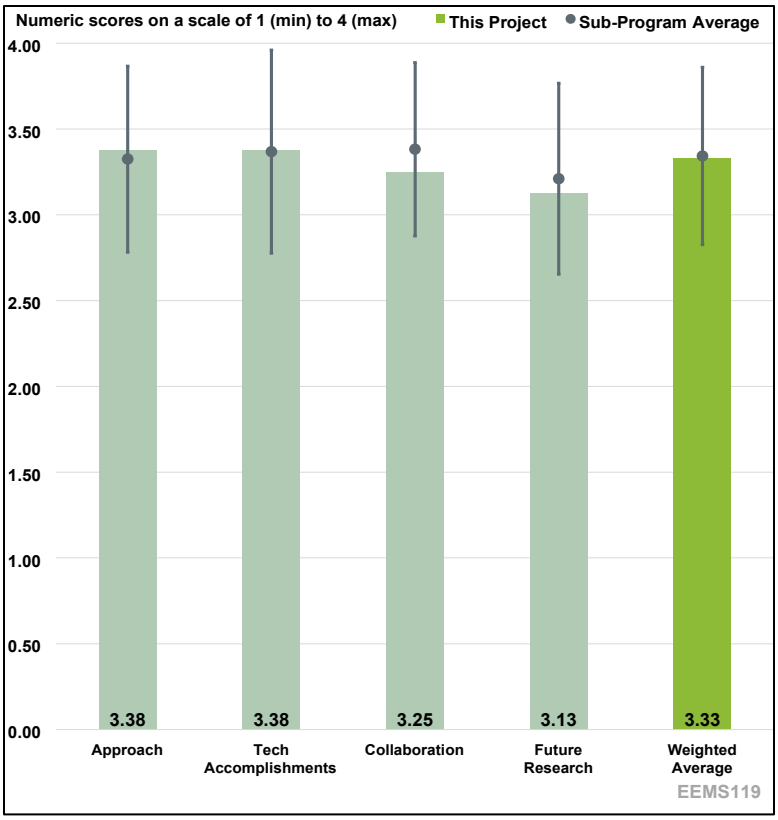

Figure 4-28. Presentation Number: EEMS119 Presentation Title: Improved Mobility and Energy Savings Through Optimization of Cooperative Driving Automation (CDA) Application for Signal Controls for Arterial Mixed Traffic Scenarios Principal Investigator: Xiao-Yun Lu, Lawrence Berkeley National Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer commented that the combination of different powertrains is commendable, and the detailed investigation into the factors and controls for CDA are well designed.

Reviewer 2

The reviewer observed that a multi-level signal optimization including both infrastructure (signal timing) and vehicle (speed) controls is demonstrated on public roads with vehicles of various powertrains following a thorough literature review, clear definition of V2X messaging framework, and lab testing. The reviewer concluded by stating that a sensitivity analysis using microscopic traffic simulation determines which parameters are of greatest importance.

Reviewer 3

The reviewer commented that when comparing fuel improvement or time improvement comparison for CAV interaction, the preference is to see some attempt to place the value in an overall

improvement as well as in the single scenario improvement that is shown; for example, the 10% improvement on Slide 14 is for a specific scenario, what percent of driving does this represent?

Reviewer 4

The reviewer asserted that the approach was not well presented at high level in the presentation. The reviewer was able to stitch it together with detailed review of slides, but it was a challenge and not well conveyed in the actual presentation. The reviewer wondered how the multi-level signal optimization method presented on Slide 8 is different from traditional approaches from traffic engines and suggested it would be good to give this context. The reviewer said in the specific use case of high demand in all directions would not utilize a green wave, so that example is not so relevant. The reviewer described the description on Slide 9 as good, but mentioned a lack of clarity on how a typical approach would manage this situation. For further explanation, this reviewer said developing the methods with historical data, is of course, the best starting point, and asked: 1) How would the method adapt to real dynamics of traffic flows in real world? 2) Would this cause times when the method is worse than traditional traffic engineering approaches? The reviewer referenced prior comments.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer noted that all reported progress is commendable and on target for the project milestones.

Reviewer 2

The reviewer said that controls look robust and complete. The reviewer said they would like to understand the constraints of the optimization better. The reviewer asked how the idea of inconveniencing a single driver for the benefit of the overall benefit of the mass of drivers could be limited.

Reviewer 3

The reviewer said it is hard to evaluate the accomplishments overall due to time limit on presentation. The reviewer commented that the topics discussed in depth seem reasonable. The reviewer asserted that on Slide 7, the range of cut-in/cut-out is not consistent, resulting in odd dynamics of driving behavior. The reviewer followed up by asking why is that and what are the broader implications of this variability?

Reviewer 4

The reviewer stated that real world operational challenges to implementation could be considered further.

Question 3: Please comment on 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?

Reviewer 1

The reviewer commented that government and lab collaboration is well-developed, and interaction with SAE CDA Committee is commendable; however, vehicle and component manufacturer industry interactions could be improved.

Reviewer 2
The reviewer made note of clearly defined roles for the variety of project partners (national laboratories, academia, and industry) that play to each one's strengths.

Reviewer 3
The reviewer commented that the material shows all laboratories contributing and communicating as expected.

Reviewer 4
The reviewer noted that Slide 20 has description of collaborations, but the slide was not covered due to time during presentation. The reviewer notes that specific roles and coordination efforts across participants were not well conveyed in the presentation, so comments on its effectiveness cannot be made.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1
The reviewer commented that the proposed work on additional heterogeneity of traffic in terms of weight class, connectivity and automation, and test cycles is appropriate. The reviewer finished by saying that further work on standards is also very appropriate.

Reviewer 2
The reviewer commented that the next steps proposed in introducing vehicles with hardware into over-the-road situations is needed to show the progress of theoretical and simulation math. A satisfactory combination with current SAE materials is good.

Reviewer 3
The reviewer noted that freeway portions of the future work were not clearly described in context of the rest of work during the presentation. It seems out of place though that may not be the case in reality. The reviewer expressed that future work slides are very general which makes it is difficult to commented on the likelihood of success.

Reviewer 4
The reviewer suggested that progress relative to percentage of time and milestones could be defined further, especially depending on accuracy of the 35% (appears to be typo upon comparison with 2023 slides) completion in the final year. The reviewer stated that future tasks had to be assumed based on milestones Slide 4 and tasks described in later slides and remaining challenges in Slide 21. The reviewer concluding by saying that future research defined in Slide 22 is "after this project" rather than describing how remaining tasks and challenges will be approached during this project.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1
The reviewer stated that content is certainly relevant to the EEMS program.

Reviewer 2
The reviewer explained that improved Traffic flow will reduce Energy Consumption for the Fleet of vehicles over the road.

Reviewer 3

The reviewer noted that the study is comprehensive and includes simulation and on-road testing of heterogeneous traffic of CAVs along with needed standards work.

Reviewer 4

The reviewer asserted that outcomes of the project support advancement and knowledge in process, equipment, powertrain, mobility management, and components.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer commented the project has a good team, simulation hardware, vehicles, and infrastructure for testing important topics covered in the project.

Reviewer 2

The reviewer noted that the team includes many partners, each with extensive resources and seemingly adequate funding. The reviewer commented that specific roles and contributions of each partner are only loosely described on Slide 20 (this was not covered in presentation due to time).

Reviewer 3

The reviewer said that, as described by the presenters, all remaining tasks are within the budget allotted.

Reviewer 4

The reviewer commented that the resources are balanced. The reviewer concluded that even though task completion appears low for the final year, the remaining planned budget for FY25 appears balanced to the effort.

Presentation Number: EEMS120
Presentation Title: A Cooperative Driving Automation (CDA) Framework for Communications
Principal Investigator: Adian Cook, Oak Ridge National Laboratory

Presenter

Adian Cook / Priyash Misra, Oak Ridge National Laboratory

Reviewer Sample Size

A total of three reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

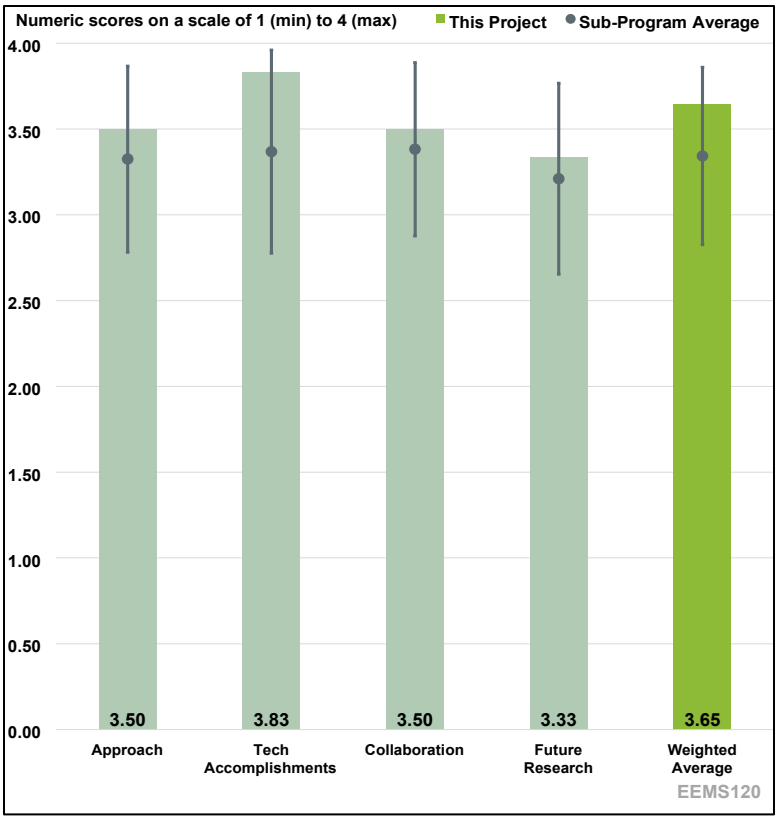

Figure 4-29. Presentation Number: EEMS120 Presentation Title: A Cooperative Driving Automation (CDA) Framework for Communications Principal Investigator: Adian Cook, Oak Ridge National Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer commented there are clearly defined barriers with appropriate simulation, XIL, and (limited) on-road testing tasks outlined. The reviewer suggested tying the metrics to forthcoming or proposed standards would be a beneficial step to add.

Reviewer 2

Very complete. The reviewer expressed an appreciation for the analysis of communication speeds needed; a thorough explanation across the bandwidth of too little to too much is very good. The reviewer advised that most unconstrained optimization would end up with the more the better, but coming to a conclusion about what is needed has the best chance of success.

Reviewer 3

The reviewer commented that the timeline is appropriate for project objectives and phases, and the approach of integration and implementation with increasing levels of hardware and reality for validation is commendable. The importance of the metrics as factors in developing and improving future CDA vehicle operations is noted. The reviewer concluded by suggesting the measure of framework success in workflow step five (5) of on-road demonstration could be defined further.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

An introduction of new and key quantitative measures for CDA (e.g., time to agreement, cooperation ration, false cooperation ration) and the detailed study of them in two scenarios both in simulation and XIL testing is noted. The reviewer commended the project for executing an impressive multi-partner simulation and XIL testing demonstration that integrated many parts of the project in a novel experiment. Several publications coming from this work are noted.

Reviewer 2

The reviewer explained that the demonstration of metrics, criteria, and fault insertion is broadly supportive of future communication testing and development.

Reviewer 3

The reviewer commented that data shown in Slides 12,13,16,18 look complete.

Question 3: Please comment on 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?

Reviewer 1

The reviewer commented that, of all presentations reviewed over the week, this was the best organized and prepared set of presenters for handing back and forth across the material during the review. The reviewer commented that the material shows all parties participating and communicating as expected.

Reviewer 2

The reviewer made note of the multiple national laboratories and DOT teams working together with clearly defined roles. The reviewer suggested that, given the focus on the framework and what might lead to standards, input from additional stakeholders in the regulation, an OEM, and standards areas could be beneficial.

Reviewer 3

The reviewer noted that government and lab collaboration is developed well, but industry interactions could be improved.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer commented that there are clearly defined steps remaining for the current project; however, proposed future work was a bit vague and could be more directed at needs/gaps that arose during the current work.

Reviewer 2

The reviewer said that, as proposed on Slide 25, getting over-the-road data to demonstrate the theory is important. The reviewer pointed out that barriers for single user adoption of Autonomous Vehicles (AV) remain, and demonstrating CAV for multiple drivers is required to help remove those adoption barriers.

Reviewer 3

The reviewer suggested that the measure of framework success in workflow step five (5) of on-road demonstration could be defined further.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer stated that improving traffic flow will reduce energy needed by the fleet.

Reviewer 2

The reviewer said outcomes of the project support advancement and knowledge in process, equipment, powertrain, mobility management, and components.

Reviewer 3

The reviewer noted the development of key novel quantitative measures (possibly on the way to standards) of CDA with tests done in simulation and XIL.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer commented that team members fill needed roles well, and the simulation and XIL testing hardware is sufficient for the goals of the project.

Reviewer 2

The reviewer said that, as described by the presenters and their material all remaining work on Slide 25 fits with budget allotted.

Reviewer 3

The reviewer commented that resources are balanced for milestones, but more direct industry engagement in final stages of vehicle validation is recommended for this large investment.

Presentation Number: EEMS121
Presentation Title: Decentralized and Cooperative Traffic Signal Network for Freight Energy Efficiency Safety Sustainability and Public Health
Principal Investigator: Michael Lim, Xtelligent

Presenter

Michael Lim, Xtelligent

Reviewer Sample Size

A total of four reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

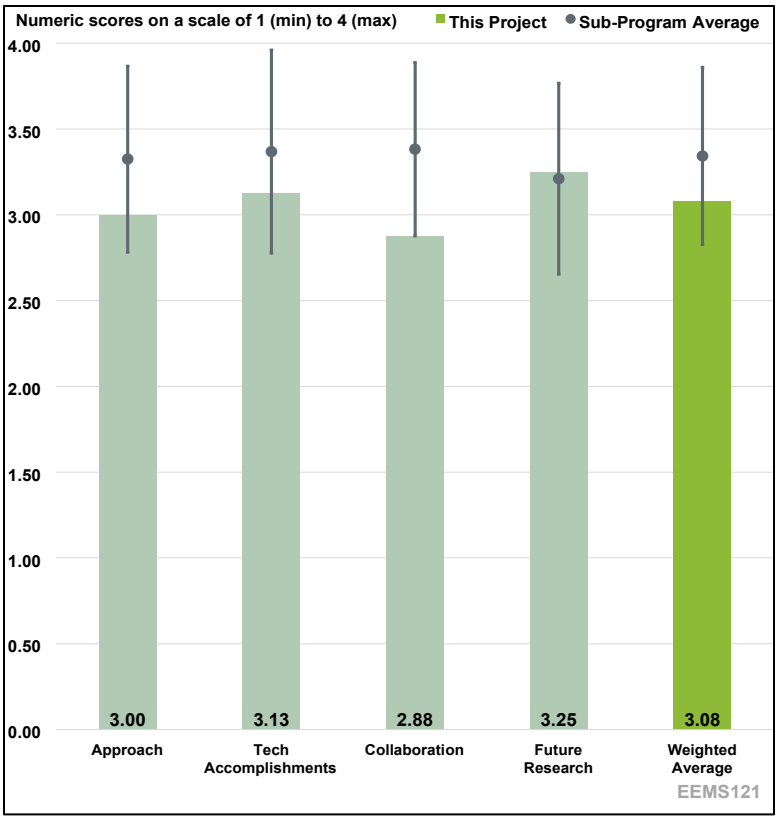

Figure 4-30. Presentation Number: EEMS121 Presentation Title: Decentralized and Cooperative Traffic Signal Network for Freight Energy Efficiency Safety Sustainability and Public Health Principal Investigator: Michael Lim, Xtelligent

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer noted that the project well addressed the barriers for implementing the developed solution into the field.

Reviewer 2

The reviewer said the approach seems good; however, it was not clear from the presentation materials or the presenter as to what data is being sent from the Connected Vehicle (CV) trucks to the traffic signal controller and what information (if any) is being sent back to the CV trucks. The reviewer added that, if information is being sent back to the CV trucks, it is not clear how that information is being used by the CV trucks.

Reviewer 3

The reviewer commented that the project's approach and team have mixed strengths and weaknesses. The reviewer stated that the focus on software solutions is strong because they do not need hardware to be installed in every vehicle, but the team admitted to being dependent on negotiations with different car companies for access to their proprietary systems. The reviewer also pointed out that the approach requires cooperation between traffic lights and the cars, which

requires buy-in from local governments and car companies, which makes gaining widespread adoption difficult. The reviewer concluded that still, the team is doing a solid job of getting early agreements and proving out the technology.

Reviewer 4

The reviewer commented that the project's approach seemed scattered and not focused to the objectives of the program. The reviewer added that they struggled to understand what problem was being solved. The reviewer finished by saying the PI presented what the company was doing as a company and not enough on sharing what was being learned and why.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer noted that the project deployed the proposed systems in three cities of California and commented that this accomplishment is very impressive.

Reviewer 2

The reviewer noted the project has gathered some data, which is probably sufficient to show that the system provides benefits in terms of time and fuel efficiency. The reviewer added that many questions remain to be answered and many of them will impact willingness for adoption.

Reviewer 3

The reviewer commented that the Level 1 system of using infrastructure-based sensors to help optimize the traffic flow seems to be working, however, the accomplishments related to the Level 2 and Level 3 systems are not clear. The reviewer observed that Level 2 relates to data being sent from the CV trucks, and it is not clear what is being sent and how it is being used.

The reviewer noted that the presenter did comment that they are trying to collect more refined data from the CV trucks. The reviewer guessed that Level 3 relates to the CV truck not only sending data, but also receiving information from the traffic controller and acting on this information. The reviewer concludes by saying it is not clear what, if any, accomplishments have been made regarding Level 3.

Reviewer 4

The reviewer asserted that the team should be clearer on exactly what had been accomplished to date and why this is important to the objectives.

Question 3: Please comment on 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?

Reviewer 1

The reviewer commented that the project team coordinated well with other partners to complete the planned tasks.

Reviewer 2

The reviewer said that partners seem to have very good collaboration with the university, lab, and prime (Xtelligent), but it is not clear how good the collaboration is with the truck partners. The reviewer clarified that this comment is based on the fact that the team is continuing to try to get more refined data from the CV trucks. The reviewer finished by saying that they are not sure whether the CV truck providers are hesitant to provide this data or if there are technical issues to overcome.

Reviewer 3
The reviewer said the project team obtained cooperation from three (3) cities and multiple car companies, which has been sufficient to prove out the technology so far. The reviewer cautioned that the planned subscription business model does seem solid for getting partnerships with more cities.

Reviewer 4
The reviewer stated that a lot of collaborators were shown, but it is unclear what each were doing.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1
The reviewer commented that the proposed future research direction is solid.

Reviewer 2
The reviewer commented that the project is 70% complete, but there seems to be significant work related to implementation of Level 2 and Level 3 for the system remaining. The reviewer emphasized the “Proposed Future Research” presentation slide because it mentions a possible extension of the traffic controller to “Multimodal signal control”, and expressed interest at the possibility of investigating, in a simulation environment, assessing the ability of the control algorithm to accommodate modes such as transit and active transportation (e.g., biking, micromobility, pedestrians, etc.)

Reviewer 3
The reviewer said there are so many more questions still to be answered about this technical approach’s value and likelihood of commercialization and adoption. The reviewer concluded by pointing out that the team has identified many of the key areas of unknowns and is pursuing getting the data and analysis to better understand them.

Reviewer 4
The reviewer asserted that at 70% completion of the project, this should be very clear, and it was not. The reviewer added that “We will keep working.”, was the message here.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1
The reviewer commented that this project covers the EEMS objective.

Reviewer 2
The reviewer stated that the project supports the EEMS goal by using CV technology to improve the energy and emissions for trucks along a freight heavy corridor.

Reviewer 3
The reviewer said the project seems relevant to EEMS and noted that it is testing a specific way to leverage the increased connectivity and automation capabilities to improve traffic efficiency.

Reviewer 4
The reviewer declared that the project is relevant, but did not understand what was being completed.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer declared that the resources for this project are sufficient.

Reviewer 2

The reviewer stated that resources seem sufficient for the work done so far and will set a solid baseline. The reviewer expressed uncertainty if continued funding would be needed for this approach to gain sufficient private sector support and traction at this point.

Reviewer 3

The reviewer said the project should have sufficient funds to implement the Level 2 and Level 3 signal control; however, it appears that there could be a limited number of CV trucks willing to participate. The reviewer concluded by saying if the topic of “multimodal signal control” (as described in the Proposed Future Work) is considered, this would likely require additional funds as it may not be in the current approach/task assignments.

Reviewer 4

The reviewer commented that the resources seemed sufficient, but the project’s scope was unclear so evaluating resources is tough.

Presentation Number: EEMS122
Presentation Title: Pathways to Net Zero Mobility
Principal Investigator: Joshua Auld, Argonne National Laboratory

Presenter

Joshua Auld, Argonne National Laboratory

Reviewer Sample Size

A total of four reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 75% of reviewers felt that the resources were sufficient, 25% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

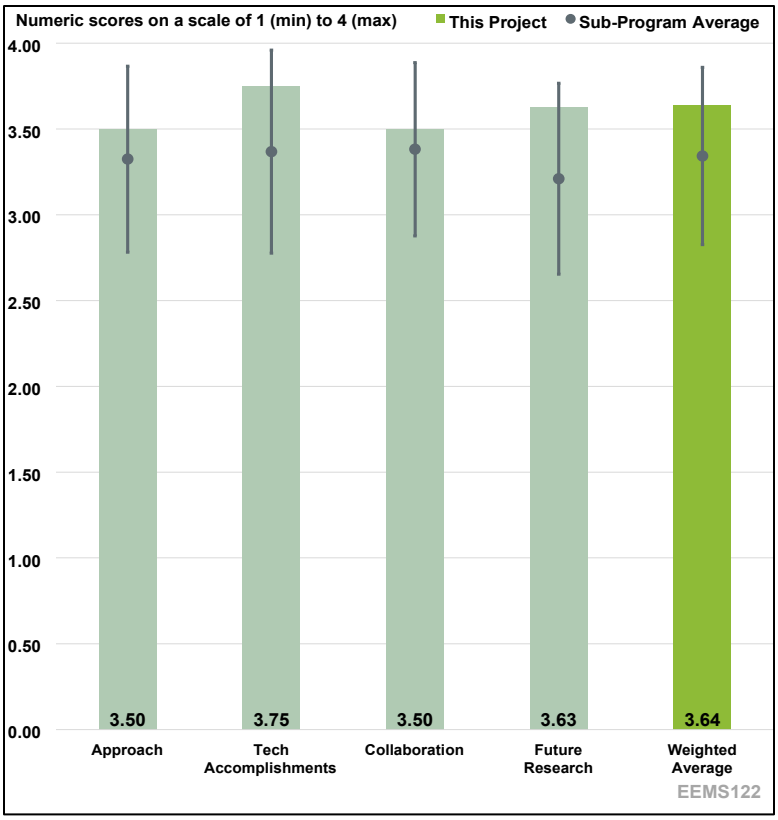

Figure 4-31. Presentation Number: EEMS122 Presentation Title: Pathways to Net Zero Mobility Principal Investigator: Joshua Auld, Argonne National Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer commented that the project using such a rich model like POLARIS should provide transportation researchers with unique insights. The reviewer explained that the multi-faceted goals are rich, deep, and novel and are well worth investigating. The reviewer commended the project, saying the multi-team approach is extremely in-depth and will yield model improvements and findings well beyond this project's scope.

Reviewer 2

The reviewer said this project works to answer important policy-relevant research questions about which strategies are effective at the regional level to meet GHG reduction goals. The reviewer expressed appreciation at the fact that the approach is inclusive in terms of consideration of a wide range of strategies—both technical and policy-based, and both established and emerging/potential strategies that require further study.

The reviewer described the modeling approach as sound and well-thought out in terms of scope and order of operations. The reviewer commented that, based on the slides and presentation, it is challenging to know what assumptions are being made about the strategies and their potential impact. The reviewer asked to what extent are the scenarios based on which strategies would have the greatest potential vs. which strategies are technically or politically feasible for a given area? The

reviewer noted that these are different research questions and could lead to different answers. Continuing, this reviewer said from a decisionmaker standpoint, it may be helpful to know both what strategies would provide the most opportunity in terms of emissions reductions per dollar invested; but also yield some information about politically feasible or more shovel-ready strategies that could be implemented quicker or easier. The reviewer suggested getting input from the stakeholder is likely to yield more of the latter kind of strategies and expressed hope that this project is also able to explore the more ambitious or significant potential policies that might be beyond stakeholders are able to imagine. The reviewer said the timeline is ambitious be feasible if the research team is able to be efficient and strategic with how stakeholder input is incorporated. The reviewer emphasized the importance of clearly laying out what kinds of assumptions are being made to estimate the impact of strategies on GHG emissions. The reviewer mentioned a lack of clarity regarding why the transit scenarios chosen are no transit service. The reviewer asked would it not be more directly relevant/useful given the real-world context to test the impact of service cuts as this is likely to precede any sort of out-right transit shutdown in the near future? The reviewer further suggested that, as transit agencies wrestle with responses to budget shortfalls, it might be more helpful for Chicago Transit Authority and others to know what kinds of impacts to expect from different kinds of service cuts (e.g. shutdown of specific lines, cutting bus routes, changes to frequency or hours of operation, etc. The reviewer explained that this would be a unique contribution of this project, as this type of sophisticated modeling has not yet been a factor in answering those kinds of questions. The reviewer asked, on the transit analysis, is the project team able to take the results and convert to GHG emissions impacts stemming from behavior and car ownership changes? The reviewer added that it would be useful to know and also ensure that part of the analysis is aligned with the net-zero frame of the study. The reviewer continued, saying with the proposed future research, there is reference to making alternative suggestions for delivery routes in the Freight and Local Delivery box. The reviewer suggested it would be great if the research is also able to yield parallel suggestions for more energy efficient options for the other five boxes of future research areas. The reviewer concluded by noting this would take advantage of the sophisticated modeling work to make science-based recommendations for alternative suggestions; for example, could one similarly make suggestions for how to lower GHG emissions impacts of CAV deployment, parking, land-use choices, etc.?

Reviewer 3

The reviewer commented that the project approach makes sense, and the timeline and work planned appear reasonable. The reviewer noted that the presentation clearly lays out the approach, including the five areas of focus, planned regional studies on decarbonization strategies in three regions, and initial barriers. One potential barrier to success (which the presentation addresses) is the potential for lengthy agreement negotiations between the various project partners, of which there are many.

Reviewer 4

The reviewer said this is a complex project with a lot of moving parts (five tasks) and collaborators (over 27 from what the reviewer could count). The reviewer continued by asserting that 3 years is too short to execute this project.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer commented that, given the complexity of the research approach, the researchers have made satisfactory progress towards completion with initial modeling results and partner set up. The reviewer stated that to fully assess this element, it is important to know more about what is going into assumptions about the GHG impacts of the scenarios; in other words, what specifically is going into the "deploy scenarios" bullet in Task 6? The reviewer concluded by saying this could be a minor or significant time commitment depending on the extent to which inputs and assumption are using established metrics from prior work versus real-world testing or additional modeling efforts needed to estimate GHG consequence of specific scenarios.

Reviewer 2

The reviewer noted that though the project has just begun, the presentation explained one study that had already been completed, which was an analysis of what would happen if transit completely vanished in the Chicago region. The reviewer added that the study demonstrates the outsized impact transit has on the region, and that without transit congestion and car ownership would increase, but that mobility and economic activity would decrease as increased congestion would cause people to cancel activities.

Reviewer 3

The reviewer said the results presented from this endeavor are not always intuitive; these results can show the power and purpose to conducting the research. The reviewer finished by asserting that few models have the capabilities of what is being worked on in this effort and the results themselves lead to additional questions to investigate that we would not otherwise have known to ask.

Reviewer 4

The reviewer stated that they could not offer a fair assessment of a project that has been active only for six months.

Question 3: Please comment on 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?

Reviewer 1

The reviewer noted that the project has an impressive set of stakeholders, and it is expected to yield a tremendous amount of valuable input and ensure more actionable scenarios and results to inform decisionmakers. The reviewer stated appreciation for the incorporation of stakeholders from different relevant private sector entities, as well as Federal, state, and local partners. The reviewer cautioned that in order to ensure time efficiency and useful feedback, it will be important to use partner input strategically and for the researchers to recognize any bias in the kinds of input they might receive from partners (e.g. decision makers might suggest a level of ambition in GHG reduction strategies that match what they understand to be feasible for them to implement specifically, rather than thinking broader; industry stakeholders may be incentivized to assume greater GHG reductions than data might show). The importance of being thoughtful in how this input is incorporated into research decisions and outputs is noted.

Reviewer 2

The reviewer commented that the collaboration partners for this keystone project are impressive and represent a wide swath of potential sectors, research institutions, laboratories, and industry.

Reviewer 3
The reviewer remarked that this project will require a lot of coordination among project partners, and it appears there are good plans in place to support that coordination. The reviewer noted that the presentation addresses that initial agreements among partners may take some time.

Reviewer 4
The reviewer stated that they could not offer a fair assessment of a project that has been active only for six months.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1
The reviewer said the list of questions proposed for future research were deep and worthwhile and answering them should help improve the scope of the model.

Reviewer 2
The reviewer remarked that, based on the proposal, there is confidence that the researchers will be able to execute the plan, given the level of work that is already been accomplished in this space and the clear approach laid out. The reviewer finished by saying the purpose is clear and it stands to be impactful and useable for decisionmakers across levels of government, provided the results and recommendations are clear and accessible for key stakeholders and decisionmakers.

Reviewer 3
The reviewer noted that because this project is only just beginning, there is no proposed future research beyond the plans for the current project. The reviewer commented that the presentation does clearly define a purpose for the future work under this project, and it does seem highly likely to achieve its targets, and the presentation does highlight linkages to other DOE projects.

Reviewer 4
The reviewer stated that they could not offer a fair assessment of a project that has been active only for six months.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1
The reviewer said yes; this project is able to support the Analysis section of the VTO program.

Reviewer 2
The reviewer commented that the use and expansion of the POLARIS model in this fashion absolutely seems in line with the goals of EEMS.

Reviewer 3
The reviewer stated that this project is highly relevant to the EEMS program objectives of improving mobility, energy, and efficiency.

Reviewer 4
The reviewer said that this project is extremely aligned with EEMS scope and goals and will make useful contributions to our understanding of range of mobility futures that could result from disruptive transportation technologies and policy levers, and the extent to which they can contribute to lower energy use and decreases in GHG emissions from the transportation sector.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer commented that this project could use whatever level of funding was allocated to it, as long as it was minimally sufficient; more resources provided will yield more results. The reviewer concluded that the values provided seem to be a good use of resources.

Reviewer 2

The reviewer said the resources appear to be sufficient for the proposed work.

Reviewer 3

The reviewer commented that resources appear sufficient to execute the project. The reviewer noted that the research should monitor the proportion of resources going toward the collaboration and coordination elements of the project; given the substantial number of stakeholders; this could easily consume significant resources if not deployed efficiently and strategically to meet the goals of the study.

Reviewer 4

The reviewer expressed serious concerns that a $7 million project will be executed in a 3-year time frame with 27 collaborators; there are a lot of moving pieces for such a short timeframe for complex research. The reviewer recommended to consider extending this project, 1 to 2 years.

Presentation Number: EEMS123
Presentation Title: Freight in the Loop
Principal Investigator: Kevin Stutenberg, Argonne National Laboratory

Presenter

Kevin Stutenberg, Argonne National Laboratory

Reviewer Sample Size

A total of three reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

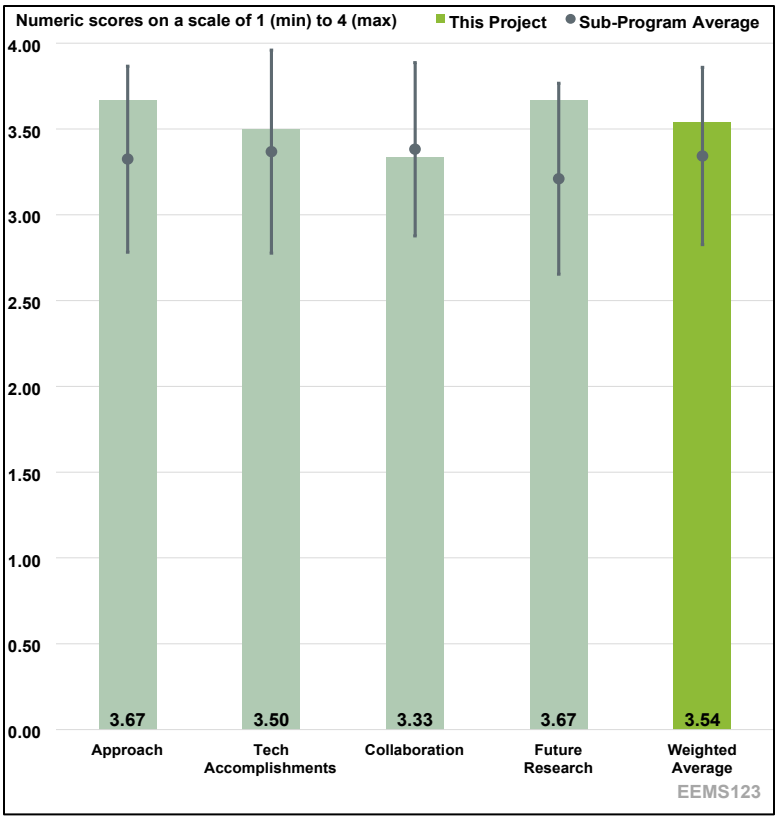

Figure 4-32. Presentation Number: EEMS123 Presentation Title: Freight in the Loop Principal Investigator: Kevin Stutenberg, Argonne National Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer commented that the project is on track to provide insight into the real-world energy impacts of advanced vehicle technologies, which is difficult to do.

Reviewer 2

The reviewer pointed out that the presentation is not a research update but an update for the construction of a new facility.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer commented that, based on the presentation, the project team has made good progress.

Reviewer 2

The reviewer noted that within seven months of the project start-date, the dynamometer has been selected and meets or exceeds all the request for proposal (RFP) requirements. The reviewer stated

that this is a significant component of the overall project plan; as of submission of the review report, the project was on time and within budget.

Question 3: Please comment on 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?

Reviewer 1

The reviewer said that according to what was presented, great collaboration has occurred between teams.

Reviewer 2

The reviewer observed that the team is leveraging expertise across ANL as well as key private contractors with strong expertise in dynamometers, and the team is also being supported by universities such as Illinois Institute of Technology. The reviewer finished by saying it is unclear exactly what contributions the universities have made.

Reviewer 3

The reviewer pointed out that the presentation is not a research update but an update for the construction of a new facility.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer noted that the future research is clearly aimed to finishing the XIL construction and dynamometer setup in order to eventually test heavy and MD CAVs and thus so far it appears very likely that the team will achieve its targets.

Reviewer 2

The reviewer remarked that the proposed idea and plan sounds interesting.

Reviewer 3

The reviewer pointed out that the presentation is not a research update but an update for the construction of a new facility.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer commented yes.

Reviewer 2

The reviewer said yes, this award seems to be part of the EEMS VTO programmatic priorities.

Reviewer 3

The reviewer commented that the project is relevant, because it helps quickly test how new mobility technologies will perform under various real-world conditions. The reviewer finished by saying the project will help us learn about the technologies' energy impacts.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer commented that the project team has a lot of work to complete in 1.5 years and significantly, the XIL site construction RFP was not issued as of April 2024. The reviewer stated that after the project is awarded in October, the team has just one year to construct the site, install the dyno, and run an XIL pilot to meet their expected timeline. The reviewer concluded by stating that it is great that the dyno that was selected was within budget and uses a known interface that will make its setup easier.

Reviewer 2

The reviewer said they are not an expert in this topic, and thus cannot weigh in on the resources needed.

Reviewer 3

The reviewer observed that this award seems to be dedicated to infrastructure, and it is unclear what is the expected timeline and the total award.

Presentation Number: EEMS124
Presentation Title: Deployment of Real-Sim/Real-Twin Scenario Library Generation and Benchmark of Energy Centric CAV Controls
Principal Investigator: Ross Wang, Oak Ridge National Laboratory

Presenter

Ross Wang, Oak Ridge National Laboratory

Reviewer Sample Size

A total of three reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

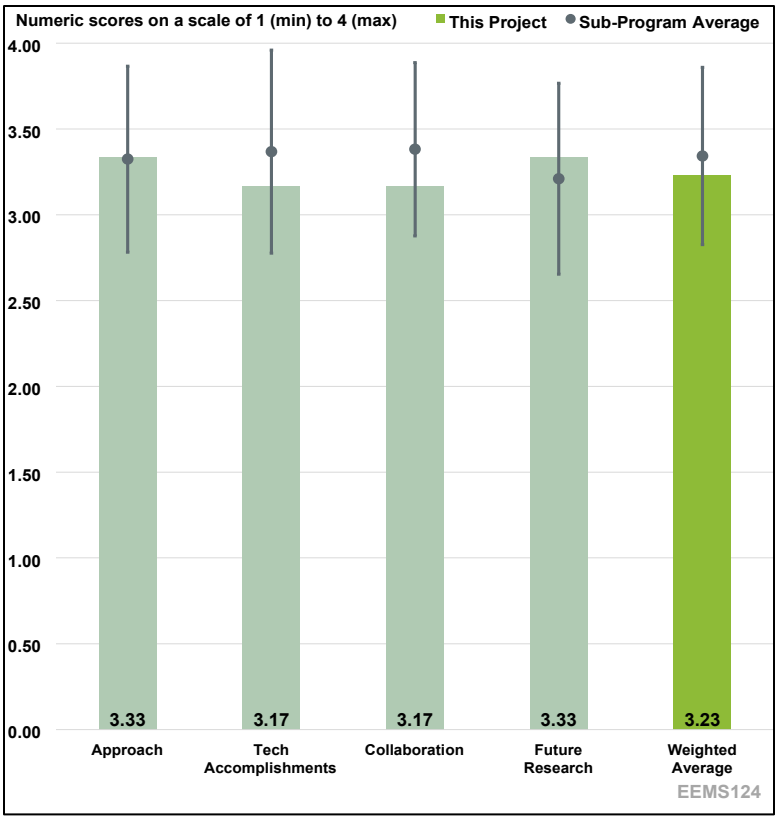

Figure 4-33. Presentation Number: EEMS124 Presentation Title: Deployment of Real-Sim/Real-Twin Scenario Library Generation and Benchmark of Energy Centric CAV Controls Principal Investigator: Ross Wang, Oak Ridge National Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer stated that the project approach is well designed to create a library of CAV simulation-based scenarios applied to real world road networks. The reviewer mentioned that it is not entirely clear what is the level of detail required in the 3D digital maps and the approach to acquire these maps for the specific scenarios. The reviewer asked if the APaCK-V vehicle-based 3D data collection will be sufficient for the needs of the scenario simulations, or will additional 3D data collection approaches/techniques also be required?

Reviewer 2

The reviewer pointed out that the project is just getting started, and the overall plan looks good.

Reviewer 3

The reviewer stated that the approach to the work appears reasonable—the team will develop digital twin scenarios in 15 real-world locations (including universities) with the goal of creating a shareable library for others to run models and to benchmark CAV technologies. The reviewer pointed out that the project has just begun, but the presentation laid out the list of project milestones over the next 2

years. According to the reviewer, the timeline makes sense. The reviewer wondered what will be the quantity of data that will be captured at each location—the locations chart in the presentation indicated a large number of intersections, but the speaker mentioned during the presentation that the goal is 10-40 intersections per location.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer noted that so far, since the project has only just kicked off recently, the project team has made good progress on their objectives. The reviewer pointed out that the project team has identified test locations, and they seem to have a good understanding of the data availability for most test locations.

Reviewer 2

The reviewer pointed out that the project is just starting. The reviewer said the selection of locations has good variation of locations, and the project team should also assess elevation changes, min/max grade, grade at intersections, road surface, impact of energy for lateral vehicle control.

Reviewer 3

The reviewer commented that the project is still in the early stages, so there has not been a lot of accomplishments or progress to date.

Question 3: Please comment on 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?

Reviewer 1

The reviewer said the project has a very good set of partners.

Reviewer 2

The reviewer noted that the project is in its early stage, but it appears that coordination and collaboration among project partners is good so far.

Reviewer 3

The viewer observed that coordination and collaboration efforts appear to support the project efforts, and partners include a number of local/state agencies and universities. The reviewer wondered how partners in each location will influence specific locations of data collection/scenario development, and what the plan might be for locations with unknown data quality (e.g., Atlanta and Athens). The reviewer finished by asking two questions: 1) Will this impact the work? 2) Does the team have backup locations identified or a plan for if a selected testing site falls through?

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer commented that the project has a strong plan and (Specific, Measurable, Attainable, Realistic, and Timely) SMART milestones.

Reviewer 2

The reviewer commented that the plan for future research appears sound, and milestone targets appear reasonable.

Reviewer 3

The reviewer commented that the project is still in its very early stages and there is a large amount of future work remaining. The reviewer suggested that perhaps the biggest challenge will be in successfully collecting meaningful data for 10+ real world locations (this is the goal) of sufficient detail to generate the simulation scenarios. The reviewer concluded that initial milestone of successfully collecting data for the first two sites will be extremely insightful to the potential future success of collecting for 10+ sites.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer noted that the project is highly relevant to EEMS program goals, and the shareable digital twin scenario library will be very useful for future EEMS projects and others to support CAV technologies.

Reviewer 2

The reviewer remarked that the project is a good match to EEMS program objectives.

Reviewer 3

The reviewer explained that the project supports EEMS and Analysis by providing sufficient real-world data to build analysis and simulation scenarios that allow for the estimation of energy benefits of CV applications. The reviewer added that sharing this data with the broader research community would also help to extend to additional simulation-based analyses since acquiring real-world data to build scenarios is often very difficult.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer emphasized the need to continue to assess resources during the project.

Reviewer 2

The reviewer commented that resources appear sufficient for the proposed work.

Reviewer 3

The reviewer commented that the project is in its very early stages, so it is difficult to judge if the funding is sufficient. The reviewer advised that collection of the 3D data has the potential to be very expensive, so making an assessment after the first two data collection sites will be important.

Presentation Number: EEMS125
Presentation Title: Energy Metrics in Traffic Signal Performance Measures
Principal Investigator: Joseph Fish, National Renewable Energy Laboratory

Presenter

Joseph Fish, National Renewable Energy Laboratory

Reviewer Sample Size

A total of three reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

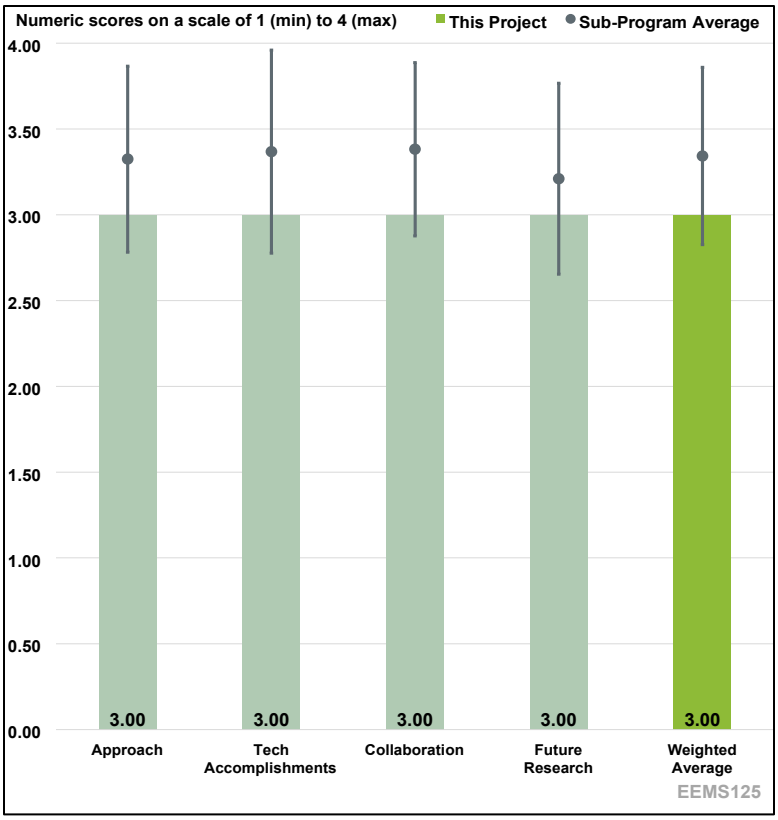

Figure 4-34. Presentation Number: EEMS125 Presentation Title: Energy Metrics in Traffic Signal Performance Measures Principal Investigator: Joseph Fish, National Renewable Energy Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

Thie reviewer noted that this project seeks to change the state of the practice by incorporating energy into automated traffic signal performance measures, which is now becoming more widespread in highway operations practices.

Reviewer 2

The reviewer described the overall approach as satisfactory but pointed out that the presentation material and the presenter at the VTO AMR did not describe an approach to account for the type of vehicle within the calculation of energy impacts of vehicles at traffic signals. The reviewer noted that energy impacts would be extremely dependent on the class of vehicle, the type of powertrain, and whether the engine is shutoff when the vehicle is stopped at a traffic signal, and no approach was described to account for any of these characteristics. The reviewer suggested that a simple approach would be to apply some overall estimate of fleet mix based on known vehicle ownership and travel survey data. The reviewer reiterated that no approach was presented. The reviewer posed a question related to the approach which is not clear in the presentation, which is whether all or certain aspects of the ATSPM-E would be propriety to Iteris, Inc., the traffic control vendor and

project partner. The reviewer added that if this is a proprietary system, ultimate deployment could be limited; clarification on this would be helpful.

Reviewer 3

The reviewer noted that the project team has a good idea about the barriers necessary to overcome; the team is, however, only 17% into the project at this time.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer noted that the project is still at a very early stage, but apparently there has not been a lot of significant progress, other than establishing that there is some market interest in the proposed ATSPM-E product from some number of current Iteris, Inc. clients.

Reviewer 2

The reviewer commented that the project is in too early a stage to be reviewed in a meaningful way. The reviewer added that, given the prominence of “assess the market potential, competitive advantage, and approach to communicate the benefits of ATSPM-E to customers” at an early-mid stage of the project, some indication of how the research teams plans to tackle this would have been good to see to alleviate any concerns that not much thought has gone into this element.

Reviewer 3

The reviewer noted that the project is early in its development.

Question 3: Please comment on 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?

Reviewer 1

The reviewer noted that the project is early in its development, but collaboration across industry and NREL seems to be good.

Reviewer 2

The reviewer commented that that NREL and Iteris, Inc. project team members appear to be collaborating and coordinating to establish the market potential of the ASTPM-E product and Iteris, Inc. has reached out to some of its clients to assess marketability of such a product.

Reviewer 3

The reviewer remarked that there is little discussion presented about the nature of collaborations related to this project, and more should be presented at the next review. The reviewer noted that the primary research partners are from NREL and Iteris, Inc, and added that the three case study communities should also be regarded as and approached as partners. The reviewer stated that identification and engagement of case study communities is a major part of this project, which requires a methodology. The reviewer highlighted a mention that “additional collaborators will be developed through the project, including state and local implementation partners,” and commented that the way these various partners are identified, approached and interacted with during the project will be areas of interest in future reviews.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer pointed out that, because the project is still in the early stages, there is much future work remaining. The reviewer noted that some of the challenges for the future work were highlighted in the presentation material, including the need to find a new third-party source of vehicle trajectory data. The reviewer concluded by saying another key part of the future work is how ASTPM-E system will determine or estimate the vehicle classification and powertrain type for vehicles using the traffic signalized intersection.

Reviewer 2

The reviewer said that with only 17% of the project accomplished, most of the scope proposed in the project lies ahead.

Reviewer 3

The reviewer noted that the project is progressing in its early stage.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer stated that the project identifies a problem that is small but ubiquitous, resulting in a likely large cumulative impact. The reviewer concluded that, “Traffic operations community lacks energy-focused metrics and calculating excessive energy for individual traffic signals requires significant computational and data resources; off-the-shelf solutions are needed.”

Reviewer 2

The reviewer stated that adding an energy component to ATSPM measures is important, because ATSPMs are becoming more important in signal practice.

Reviewer 3

The reviewer commented that the project supports EEMS by aiding in the development of a real-world system to calculate the energy impact of vehicles using traffic signalized intersections.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer said that the resources appear to be sufficient.

Reviewer 2

The reviewer noted that the project is still in the early stages but appears to have sufficient funding resources.

Reviewer 3

The reviewer commented that at this time, there is nothing reported to suggest misalignment between the project and available resources.

Presentation Number: EEMS126
Presentation Title: Arena Mobility Hubs for an Equitable Low-Carbon Future
Principal Investigator: Jeff Baer, The EV Button

Presenter

Jeff Baer, The EV Button

Reviewer Sample Size

A total of three reviewers evaluated this project.

Project Relevance and Resources

33% of reviewers felt that the project was relevant to current DOE objectives, 67% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 67% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 33% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

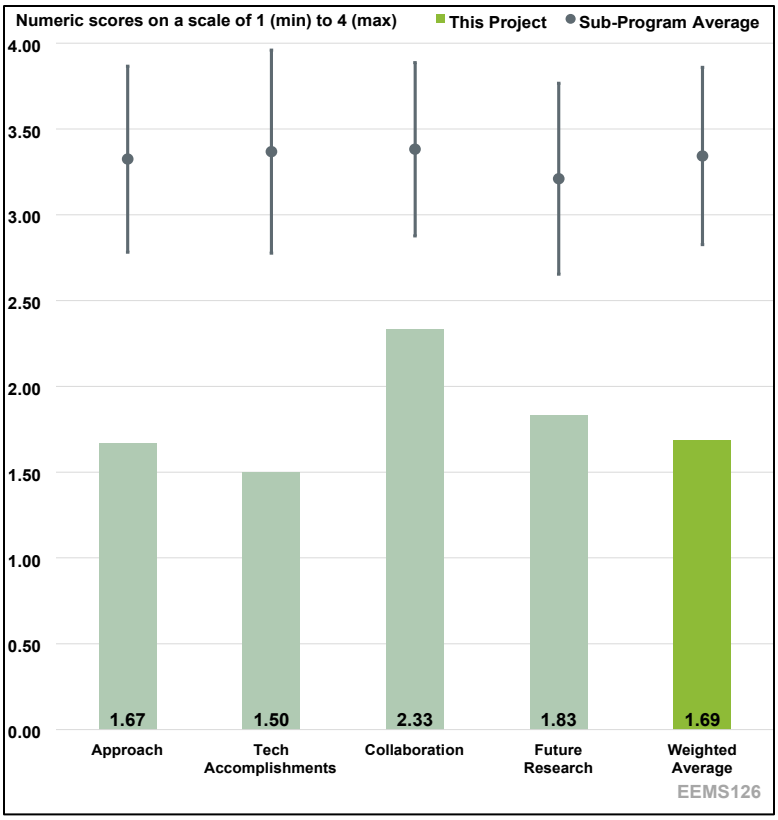

Figure 4-35. Presentation Number: EEMS126 Presentation Title: Arena Mobility Hubs for an Equitable Low-Carbon Future Principal Investigator: Jeff Baer, The EV Button

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer recognized this project is in its early stages and did expect all the technical barriers to be addressed. The reviewer acknowledged that the proposal creatively addresses an issue around siting EV chargers where there is already existing electrical capacity; a critical issue that can also be extremely time consuming and expensive.

Reviewer 2

The reviewer commented that the presenter could not provide a clear argument that there was a market for the arena-focused charging hub as proposed. The reviewer said that for commercial activity and trucks in particular, it was very unclear whether there was demand for charging infrastructure that would be subject to periodic restrictions to manage load. The reviewer stated that it may be that there is a location where there is a nexus of large-scale periodic power availability and demand for such power, but there was no demonstration that the proposed location is that place.

Reviewer 3

The reviewer stated that the project describes itself as trying to make it possible to profitably operate EVs by using the existing infrastructure at Amerant Arena as the starting point. The reviewer asserted that it is not clear what the project itself has actually done.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer said that technical accomplishments and progress referenced work that has been accomplished mostly by other organizations and parties at this stage in the project. The reviewer finished by saying research showed multiple key factors for consideration in siting chargers in key locations, as well as how they could accomplish additional goals such as Justice40.

Reviewer 2

The reviewer stated that the need for and benefits of this project were not demonstrated.

Reviewer 3

The reviewer acknowledged that it is important to have meetings with the community and understand specific need but wondered what has the project actually done other than displaying a map of underserved communities.

Question 3: Please comment on 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?

Reviewer 1

The reviewer commented it seems at this stage of the project, a significant effort to collaborate with the community by reaching out to a large number of local businesses and organizations to solicit feedback has been made. The reviewer acknowledged that getting the right input is a challenge and ensuring that there is a diverse stakeholder group will be important to the success of this project.

Reviewer 2

The reviewer observed that, at least partly because of turnover, there appear to be substantial communication gaps.

Reviewer 3

The reviewer noted that the project has solicited and met with businesses in the local area and is acquiring feedback; however, the project did not communicate any impact, saying that is “ongoing.” The reviewer stated that not much more could be discussed, such as early findings, interesting nuggets, or anything to confirm that the project is on the right track.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer commented that it is good to see that additional outreach is ongoing to ensure compatibility between the project and the local community. The reviewer advised that as direct current fast chargers are often used by transient population, it would seem important to see how these fit into the wider network of available chargers and needs. The reviewer concludes by saying they expected to see more in this future research section considering the stage of the project.

Reviewer 2

The reviewer asserted that at this point, a clear purpose and market should have been defined, but they are not. The reviewer stated that there was not a clear path forward that was presented for the project.

Reviewer 3

The reviewer raised concerns about the project producing significant impacts. The reviewer observed that one glaring problem is that the very basic assumptions for the project seem to have fundamental flaws, and in others, even if what they posit is true, it is not clear how the project is actually addressing the concerns; for example, it is true that installing public charging is not easy and is not cheap. The reviewer provided two points: 1) It is getting easier and faster and funding through National Electric Vehicle Infrastructure (NEVI) is addressing this. 2) But more importantly, the project claims that can provide charging in months and not years is not borne about by any evidence, since it does not appear the project has actually charged even one vehicle (let alone used connectivity or automation to address the mobility concerns of underserved communities). The reviewer said it is also not clear how one of the project's claimed advantages (access to power from the arena during non-events) will translate to creating value for businesses or consumers who utilize electrified vehicles. The reviewer concluded by stating that if businesses/consumers (and what about underserved communities) can only charge during arena non-events, this sporadic availability seems to be a significant impediment, and how the projects seek to address this was not discussed (or even raised as an issue, which seems even more concerning).

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer stated that EV charging will require a lot of creative problem solving, especially in this early stage, and experimentation is key to finding solutions that work.

Reviewer 2

The reviewer commented that the location of this project seemed to be predetermined based on the willingness of the arena to participate, so it is not clear at all that the project as proposed can be generalized. The reviewer suggested that perhaps a different study of how future transportation-based electric loads might be balanced within a context of other variable loads might be useful, but given the uncertain market, even that would be highly speculative at this time.

Reviewer 3

The reviewer stated that the response to this question was referenced in prior comments.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer said resources seem sufficient, and planning and expediency would seem to have some room for improvement.

Reviewer 2

The reviewer stated that the response to this question was referenced in prior comments and said this question is really moot.

Reviewer 3

The reviewer has concerns about the impacts the project is capable of providing.

Presentation Number: EEMS127
Presentation Title: Deploying Autonomous On-Demand Energy Efficient Mobility Solutions in Tulsa's Underserved Communities
Principal Investigator: Samitha Samaranayake, Cornell University

Presenter

Samitha Samaranayake, Cornell University

Reviewer Sample Size

A total of three reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 67% of reviewers felt that the resources were sufficient, 33% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

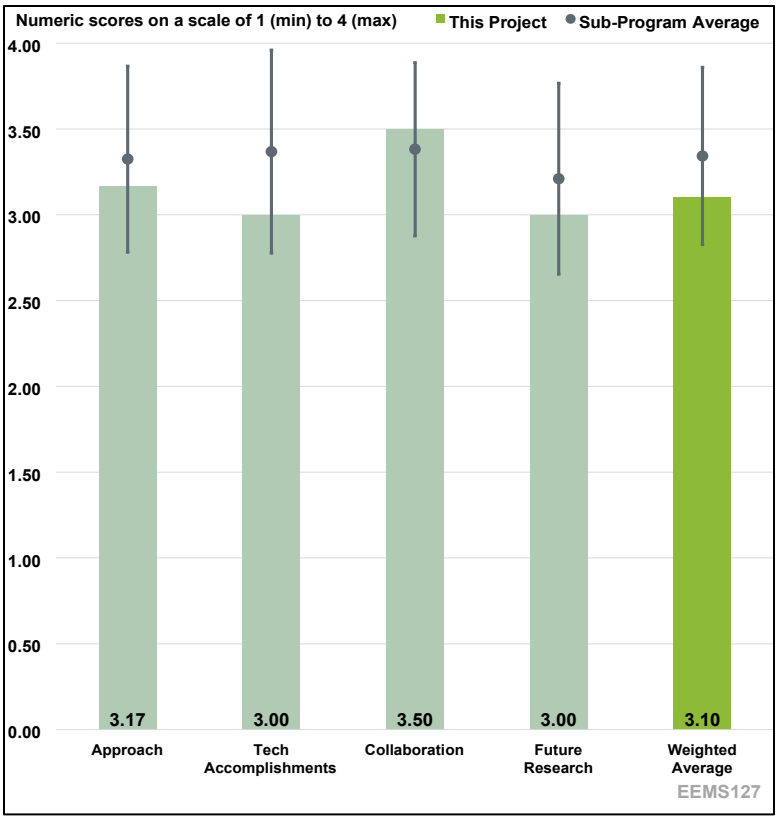

Figure 4-36. Presentation Number: EEMS127 Presentation Title: Deploying Autonomous On-Demand Energy Efficient Mobility Solutions in Tulsa's Underserved Communities Principal Investigator: Samitha Samaranayake, Cornell University

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer described the approach as excellent. The reviewer cautioned that the term "digital twin" is often misused and overused (not the fault of the researchers). The reviewer concluded by asking within the context of the project, is this just a traffic microsimulation?

Reviewer 2

The reviewer commented that the project is still in the early phases, but it appears that the project plan will address the identified technical barriers.

Reviewer 3

The reviewer noted that the project recently kicked off, and the approach seems to be relatively well thought out. The reviewer said the inclusion of community participation and engagement is key to the project, and it seems strong. The reviewer observed that because this project is diving into new territory, being perhaps the first non low-speed autonomous vehicle (AV) microtransit pilot in the United States, there are many barriers to the project's success, including regulations, community buy-in, vehicle procurement, implementing the vehicle technology, and more. The project's plans to deploy four vans for a one-year pilot are mentioned. The reviewer expresses being nervous that the

vans are not yet procured, given recent issues procuring transit vans. The reviewer concluded by acknowledging there is quite a bit of work to be done on the microtransit service: determining service area, completing routing algorithms, etc.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer mentioned that per the presentation, the project is a bit late getting started due to contracting issues; however, it appears sufficient progress is being made across the three fronts of engagement, vehicle acquisition, and modeling.

Reviewer 2

The reviewer commented that although the project has only recently begun, the team is making good progress. The reviewer commented that the presentation did not include a list of milestones and their target dates to better assess how and when technical progress would be made, but it seems that initial work of community engagement, some work on the microtransit algorithms, and some steps of vehicle procurement have taken place.

Reviewer 3

The reviewer said it was not clear if the AV retrofit on the E-transit van would have a safety driver.

Question 3: Please comment on 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?

Reviewer 1

The reviewer commented that it appears there is significant collaboration and cooperation in this project, and that the team continues to consider collaboration efforts that will support this project. The reviewer followed up by pointing out that, for example, early coordination with the local community has already take place, and the project team is coordinating with other localities who are deploying AV microtransit, such as Houston and Oslo.

Reviewer 2

The reviewer said the proposed collaboration appears to be well thought out and effective, and there is a good distribution of work across stakeholders, with each contributing per their area of expertise.

Reviewer 3

The reviewer noted that Slide 6 has a nice description about who is doing what.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer remarked that the proposed future work aligns well with the project objectives.

Reviewer 2

The reviewer stated that the proposed future research for the most part looks good, and the presentation addresses work to be completed in the next 2 years. The reviewer noted that milestones and target dates are not clearly defined, and there will be a lot of coordination required for this project's success; for example, successfully retrofitting of the transit vans with AV tech, successfully deploying the AV vans, coordinating with Tulsa Transit and the local community, and more.

Reviewer 3

The reviewer mentioned that the Federal Transit Administration (FTA) has conducted pilots similar to this (i.e. May Mobility in Arlington, Texas), and suggested that the team should reach out to FTA to understand results.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer stated that the project is absolutely relevant, and expressed they were looking forward to monitoring progress.

Reviewer 2

The reviewer asserted that this project directly supports the EEMS subprogram, and the framework of identifying user needs, modeling/simulation and a pilot project to check results is sound.

Reviewer 3

The reviewer said the project is highly relevant to EEMS program goals.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer stated that the project has sufficient resources.

Reviewer 2

The reviewer commented that resources appear to be sufficient but expressed uncertainty over whether the timeline is sufficient to achieve the amount of work proposed.

Reviewer 3

The reviewer said that cost overrun issues are foreseeable in the acquisition/deployment/ maintenance of the AV fleet.

Presentation Number: EEMS128
Presentation Title: National Impacts of Community-Level Strategies to Decarbonize and Improve Convenience of Mobility
Principal Investigator: Christopher Hoehne, National Renewable Energy Laboratory

Presenter

Christopher Hoehne, National Renewable Energy Laboratory

Reviewer Sample Size

A total of two reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 100% of reviewers felt that the resources were sufficient, 0% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

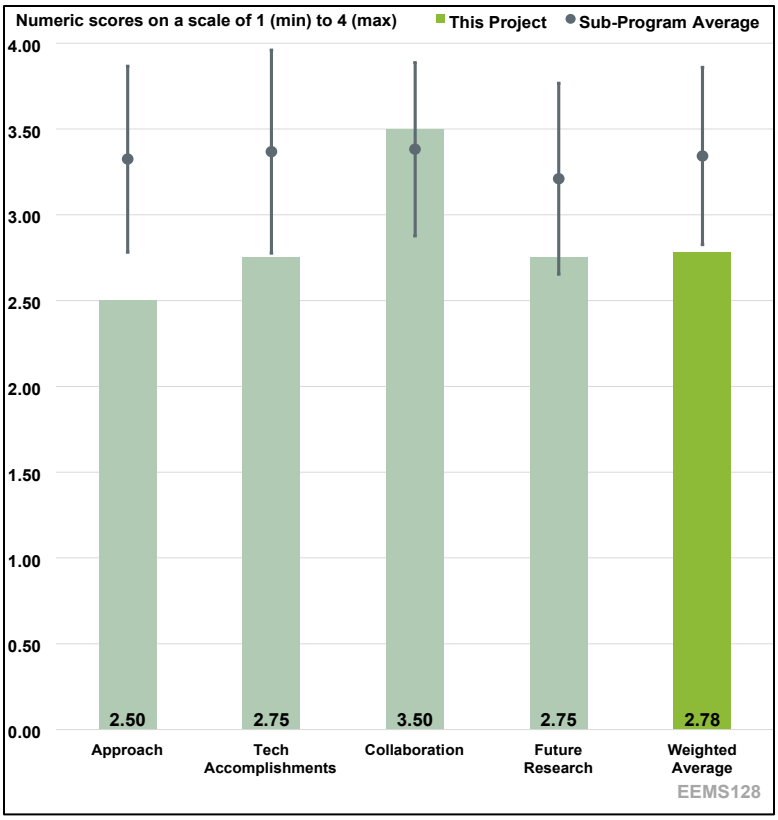

Figure 4-37. Presentation Number: EEMS128 Presentation Title: National Impacts of Community-Level Strategies to Decarbonize and Improve Convenience of Mobility Principal Investigator: Christopher Hoehne, National Renewable Energy Laboratory

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer commented that the project appears to be well constructed to address the technical barriers; however, it remains to be seen if the mapping between tools will be successful. The reviewer suggested it would be beneficial to re-apply learned decarbonization strategies back to the existing regional-scale models after initial mapping on a partial/half regional model set. The reviewer concluded this will help determine if the correlation works on similar geo-type regions, or if other factors have a stronger influence.

Reviewer 2

The reviewer said that the Blueprint calls for an “interagency group to develop tools and collect data to better understand behavioral changes and opportunities to manage travel demand” (assuming that this project is one of those tools) does not make that a technical barrier to this project; it creates an impetus for the project, but it is not a barrier. The reviewer noted that the project’s objective is to extend the high-fidelity regional modeling (POLARIS) to the national scale (Transportation Energy and Mobility Pathway Options (TEMPO)), via Geospatial Transportation Technology (GTT), which will create county-wide results and generate insights. The reviewer described the project as

incredibly ambitious and but also a bit conflicted. The reviewer elaborated by explaining that the intended audience (the person or entity who will utilize the outputs from this project) is not clear. The reviewer wondered if this a tool for policymakers, and if so, at what level (fed, state, regional, or local)? The reviewer observed that it seems the project is trying to nationalize a regional model with which to inform communities. The reviewer expressed that it is not clear how this will be done, although it seems that is what the project hopes to do in future years. The reviewer asked how exactly will this tool and/or the knowledge generated from this project be used, and what can the intended audience do with this tool/knowledge that it otherwise could not do?

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer said the project was recently initiated but appears to be on track for progressing towards Year 1 deliverables.

Reviewer 2

The reviewer noted that the project is only just getting started, and the major accomplishment is developing a crosswalk to connect POLARIS outputs to GTT model, seen in Slide 7. The reviewer acknowledged and recognized the inherent limitations of the AMR format, but it was not clear what the 6 geotypes were (A-F) and how that related to the microtypes (1-6). The reviewer suggested that, in general, it would have been helpful to have a better explanation of what outputs are needed from POLARIS to feed into GTT, and what outputs from GTT feed into TEMPO (which is presumably what the approach is (based on process flow on Slide 4). The reviewer recommended VTO should have a strong go/no-go stage gate to assess if the project is making meaningful progress and to take appropriate steps to re-scope/de-scope as results warrant.

Question 3: Please comment on 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?

Reviewer 1

The reviewer acknowledged that project team collaborates very well across national laboratories. The reviewer added that the project steering committee appears to have a wide range of stakeholders.

Reviewer 2

The reviewer commented that intra-lab coordination appears to be smooth and noted the importance of the external advisory board/steering committee. The reviewer did, however, say the project seems a bit heavy at the federal and national level, given that a key desired goal is to help communities with “limited resources”.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

The reviewer said the future work plan appears to be sufficient to complete the project.

Reviewer 2

The reviewer acknowledged that from SMART 1.0 to SMART 2.0, both DOE and the national laboratories have discovered that integrating disparate models is very challenging. The reviewer observed that the national laboratories have learned how to make improvements and how to better

identify integration issues around data formatting and so forth. The reviewer raised a major concern: even if successful at integrating these models, will that be able to generate insights in a manner and format that is straightforward to implement?

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer said this project supports the EEMS subprogram objectives.

Reviewer 2

The reviewer stated the project is certainly relevant to VTO.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer commented that resources are sufficient to successfully complete the project.

Reviewer 2

The reviewer states that this is not a trivial amount of funding.

Presentation Number: EEMS129
Presentation Title: Using Artificial Intelligence to Predict Ridership and Optimize Shared Mobility
Principal Investigator: Josh Rands, Terracity

Presenter

Josh Rands, Terracity

Reviewer Sample Size

A total of three reviewers evaluated this project.

Project Relevance and Resources

100% of reviewers felt that the project was relevant to current DOE objectives, 0% of reviewers felt that the project was not relevant, and 0% of reviewers did not indicate an answer. 67% of reviewers felt that the resources were sufficient, 33% of reviewers felt that the resources were insufficient, 0% of reviewers felt that the resources were excessive, and 0% of reviewers did not indicate an answer.

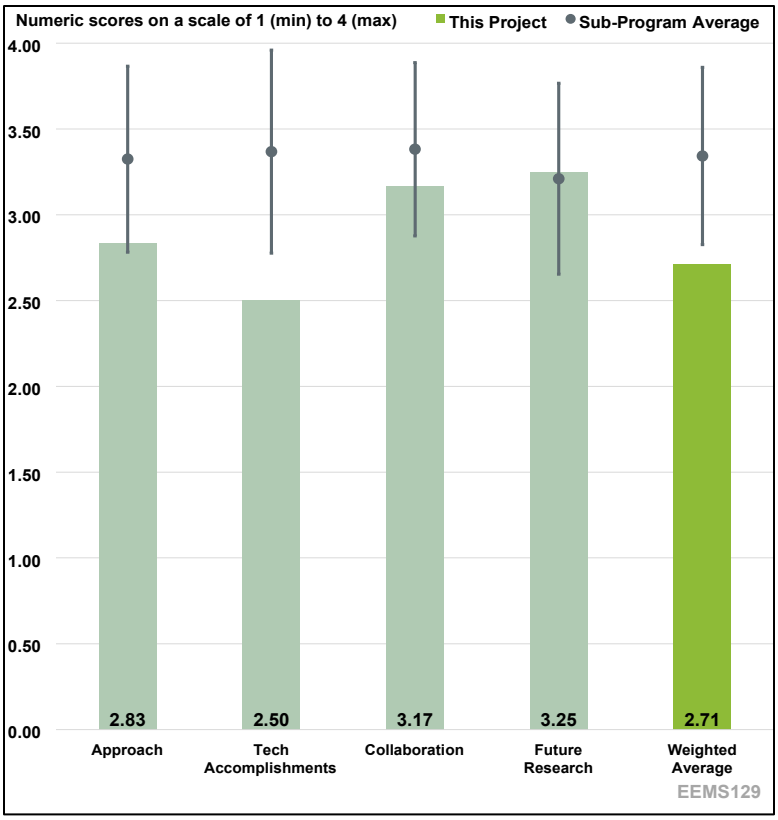

Figure 4-38. Presentation Number: EEMS129 Presentation Title: Using Artificial Intelligence to Predict Ridership and Optimize Shared Mobility Principal Investigator: Josh Rands, Terracity

Question 1: Please comment on the degree to which technical barriers are addressed. Is the project well designed, and is the timeline reasonably planned?

Reviewer 1

The reviewer commented that there were not significant technical details presented about their approach, but the general approach they followed for gathering data and leveraging ML approaches for analyzing the data and providing meaningful insights seemed solid.

Reviewer 2

The reviewer said the project seems very well designed and has a practical approach to obtaining and using data sources. The reviewer stated that the workflow and data sources seem to be informed by a significant amount of additional expertise, and there are clear timelines to follow.

Reviewer 3

The reviewer stated that, from the material, it could not be determined if the alignment of the tool to the results on Slide 14 was because the tool was fed and calibrated with the available data, making the results of the tool a circular logic loop. The reviewer finished by saying the material does not show any of the math, inputs or constraint, only graphs of use.

Question 2: Please comment on the technical progress that has been made compared to the project plan.

Reviewer 1

The reviewer pointed out that the project team has successfully built and proven, to some extent, a model that has some value. The reviewer followed up by mentioning that the team admits, however, that the landscape is quite complex, and a lot of work will need to be done, to get a better picture of transportation behaviors of large numbers of people.

Reviewer 2

The reviewer acknowledged that the system appears to be providing meaningful results and is in a stage of tweaking and improvement. The reviewer explained that this can be an infinite source of work to do, as there will never be perfection, but the results shown versus actual data seems to be remarkably in line at this stage for the scenarios presented. The reviewer concluded by saying multiple pilot projects will provide useful input into what improvements the model could use.

Reviewer 3

The reviewer commented that there is no discussion of what makes regions different and why scheduled use of the different modes of transportation is why it is for the give cities/regions on Slide 14. The reviewer wondered why there is such high amount of walking in Denver and Boulder, but a small walkable downtown like Golden is less than one half of those? The reviewer finished by saying Slide 15 shows demographics but no link to why they are important for modes of transportation.

Question 3: Please comment on 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?

Reviewer 1

The reviewer remarked that key partners specified in this project seem to be useful key players. Interviews with over 50 industry experts and the industry advisory group are noted for providing a strong base of coordination for ensuring project success.

Reviewer 2

The reviewer said it seems the project team needs to further emphasize collaboration with other entities. The reviewer added doing so can help them gain access to more and more useful kinds of data and help the project team establish partnerships that will drive adoption of this technology.

Reviewer 3

The reviewer pointed out that the project utilized NREL for progress. The reviewer did not see how Go-Vuba participation leads to results but understands it may have been in the data for Slides 15-17.

Question 4: Please comment on the proposed future research. Has the project clearly defined a purpose for future work? To what extent will future work likely achieve its targets?

Reviewer 1

Proposed future work to complete their evaluation is solid. It is difficult to say if future work beyond that, at least at a similar level, will yield significant impacts.

Reviewer 2

There were clear next steps and proposed future research for this project, and they would seem very much in line with the stated objectives.

Reviewer 3

The reviewer commented that the project is complete as of May 2024.

Question 5: Please comment on the relevance of the project. Does the project support the overall VTO subprogram objectives?

Reviewer 1

The reviewer stated the work is relevant to the EEMS objectives because it aims to increase understanding of traffic and usage patterns of a wider range of transportation modes.

Reviewer 2

The reviewer remarked that multimodal and shared mobility modeling of transportation and the interactions between modes is still an active area of exploration, and this project seems to bring a deep well of information to inform decision-makers on the topic.

Reviewer 3

The reviewer expressed uncertainty over whether the ridership of the various mode of transportation will result in lower energy or CO_2 emissions. The reviewer suggested that the work can potentially be coupled with optimization of CO_2 use for reduction, but there are similar types of optimizations already being done. The reviewer finished by saying that the project might not be to be additive to those projects.

Question 6: Please provide comments on the resources of the project. Are the resources sufficient for the project to achieve the stated milestones in a timely fashion?

Reviewer 1

The reviewer noted that the program is complete and no future funding is needed.

Reviewer 2

The reviewer commented that resources seem to be sufficient but was unclear from the presentation if any additional resources were needed to be successful.

Reviewer 3

The reviewer said as the team showed, the limited data they were able to get access to and the limited scope seemed to hamper gaining understanding at sufficient scale or understanding sufficiently in more detail other existing methods that provide more insight. The reviewer continued by saying it could be a worthwhile path to pursue to gain better insight about these kinds of behavioral and traffic patterns, but it currently seems like it will require more resources to gain access to more and more types of data and do more sophisticated modeling.

Acronyms and Abbreviations – EEMS

Abbreviation	Definition
3D	Three-dimensional
ACC	Adaptive cruise control
ADS	Automated driving system
AI	Artificial intelligence
AMR	Annual Merit Review
ANL	Argonne National Laboratory
AV	Autonomous vehicle
APaCK-V	Argonne Perception and Connectivity Kit - Vehicle
ATSPM-E	Automated Traffic Signal Performance Measures-Energy
AVL	company name
BEAM CORE	Behavior, Energy, Autonomy, Mobility Comprehensive Regional Evaluator
BP	Budget Period
C-V2X	Cellular-vehicle-to-everything
CARB	California Air Resources Board
CAV	Connected and automated vehicle
CDA	Cooperative driving automation
CERPMs	Chip-Enabled Raised Pavement Marker(s)
CO_2	Carbon dioxide
CRC	Cyclic redundancy check
CV	Connected vehicle
DGMARL	Decentralized graph-based multi-agent reinforcement learning algorithm
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
Eco-ATCS	Ecological Adaptive Traffic Control System

Abbreviation	Definition
ECO_PI	Ecological Performance Index
EEMS	VTO Energy Efficient Mobility Systems subprogram
EV	Electric vehicle
FFC	Federal Communications Commission
FHWA	Federal Highway Administration
FIXS	Flexible interface for XIL simulation
FTA	Federal Transit Administration
GHG	Greenhouse gas
GM	General Motors
GSA	General Services Administration
GTT	Geospatial Transportation Typology
HD	Heavy-duty
HV	Human-driven vehicle(s)
INL	Idaho National Laboratory
IOO	Infrastructure Owner Operator
LBNL	Lawrence Berkeley National Laboratory
MD	Medium-duty
MEP	Mobility energy productivity
MITIE	Micromobility-Integrated Transit and Infrastructure for Efficiency
ML	Machine learning
N/A	Not Applicable
NEVI	National Electric Vehicle Infrastructure
NHTSA	National Highway Traffic Safety Administration
NREL	National Renewable Energy Laboratory
OEM	Original equipment manufacturer

Abbreviation	Definition
ORNL	Oak Ridge National Laboratory
PI	Principal investigator
PNNL	Pacific Northwest National Laboratory
POLARIS	ANL's high fidelity predictive transportation system model
PR	Pooled rideshare
QA	Quality assurance
RDD&D	Research, development, demonstration, and deployment
RFP	Request for proposal
RRC	Rolling resistance characterization
RR(s)	Radar retro-reflector(s)
SAE	SAE International, formerly Society of Automotive Engineers
SBIR	Small Business Innovation Research
SMART	Specific, Measurable, Attainable, Realistic, and Timely [milestones]
SMART	Systems and Modeling for Accelerated Research in Transportation
SoS	System of System(s)
SPaT	Signal phase and timing
T3CO	Transportation, Technology, and Cost of Ownership
TAT	Traffic analysis tool
TEMPO	Transportation Energy and Mobility Pathway Options
TFHRC	Turner-Fairbank Highway Research Center
TTS	Traffic Technology Services
UCI	University of California, Irvine
V2I	Vehicle-to-infrastructure
V2V	Vehicle-to-vehicle
V2X	Vehicle-to-everything

Abbreviation	Definition
VECTOR	Visual-Enhanced Cooperative Traffic Operations
ViL/VIL	Vehicles-in-the-loop
VISSIM	PTV VISSIM – Traffic Simulation Software
VMS	Variable message sign
VOICES	Virtual Open Innovation Collaborative Environment for Safety
VRU(s)	Vulnerable road user(s)
VTO	Vehicle Technologies Office
VTOL	Vertical take-off and landing
XIL	Everything-in-the-loop
ZEV(s)	Zero emission vehicle(s)

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