

2023 Vehicle Technologies
Annual Merit Review
June 12–15, 2023

Guidelines and Slide Examples
R&D Oral Presentations

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Changes at a Glance for 2023

- All oral presentations and posters must be uploaded through [this Google Form](#) no later than **APRIL 14, 2023**.
- The AMR will be virtual.
- Please use a 16:9 aspect ratio for your slides.

Submission Deadline

Presentations and posters must be uploaded through [this Google Form](#) no later than

APRIL 14, 2023.

No exceptions.

Legal Indemnification

FOR INFORMATION ONLY. **DO NOT INCLUDE IN PRESENTATION.**

By submitting a presentation file to Oak Ridge Institute for Science and Education (ORISE) for use at the U.S. Department of Energy's (DOE's) Vehicle Technologies Office Annual Merit Review Meeting and to be provided as hand-out materials, and posting on the DOE's website, except for employees of the Federal Government and DOE laboratory managing and operating contractors, the presentation authors and the organizations they represent agree to defend, indemnify and hold harmless ORISE, its officers, employees, consultants and subcontractors, and the DOE from and against any and all claims, losses, liabilities or expenses which may arise, in whole or in part, from the improper use, misuse, unauthorized use or disclosure, or misrepresentation of any intellectual property claimed by others. Such intellectual property includes copyrighted material, including documents, logos, photos, scripts, software, and videos or animations of any type; trademarks; service marks; patents; and proprietary, or confidential information.

Employees of Federal Government agencies and DOE laboratory managing and operating contractors collectively represent and warrant that they have acquired the rights and/or permission for use of all intellectual property, as listed above and claimed by others, that is needed for developing and submitting a presentation file to ORISE for use at the DOE's Vehicle Technologies Office Annual Merit Review Meeting, and to be provided as hand-out materials, and posted on the DOE's website.

Creating Your Presentation Files

- Your presentation is public and will be posted to the DOE Vehicle Technologies Office (VTO) Annual Merit Review (AMR) website.
- You are required to create the following two files:
 - A Microsoft **PowerPoint** file following the instructions and guidelines contained within this PowerPoint template. Acceptable formats for presentations are either .ppt or .pptx
 - Once your PowerPoint presentation is complete, you must create a PDF version of your PowerPoint presentation following the instructions in this document.
- You may design your slides on either a PC or a Mac.
- **Naming your files:** Use the file name that ORAU sent you in your presentation request email to name your electronic PowerPoint and Adobe files:

Proj#_PI LastName_2023_o

Example: ACE002_smith_2023_o

Overall Presentation Structure

- **Primary Presentation:** These are the slides you will actually be presenting.
 - Please only include work that has taken place since the 2022 AMR.

| Time slot duration | Maximum number of slides |
|--------------------|--------------------------|
| 60 minutes | 40 slides |
| 45 minutes | 30 slides |
| 30 minutes | 20 slides |
| 15 minutes | 10 slides |

- **Technical Backup Slides:** These will be included in the presentation file but are intended to answer questions/provide additional information. These will be posted on the VTO AMR website.
 - Maximum 5 slides
 - Place these slides after the main presentation and separate them with a divider that says, *“Technical Backup Slides.”*

Overall Presentation Structure (Continued)

- **Reviewer-Only Slides:** These will not be posted on the VTO AMR website.
 - We do not require reviewer-only slides, but we recommend that you prepare slides to elaborate on issues of interest to the reviewers.
 - There is no limit to the number, but you should limit the number of slides to essential information and not overwhelm the reviewers.
 - Place these slides after any “Technical Backup” slides and separate them with a divider that says, *“Reviewer-Only Slides.”*

Formatting Your Presentation

- **Format:** Use a 16:9 format for your presentation:
 - PC: Design → Slide size → Widescreen (16:9)
 - Mac: File → Page Setup → Slides sized for → 16:9
- **Font:**
 - Do not use proprietary fonts. All fonts in the presentation must be standard across Windows and Mac platforms or information may be lost when creating the Adobe PDF version of your presentation. Use only Arial, Times New Roman, Courier New, Verdana, or Trebuchet MS.
 - Use at least a 12-point font.

Formatting Your Presentation (Continued)

- Ensure there is high contrast between text and background for best readability. We recommend a white background along with black or dark text. Light or gray text is hard to read at a distance so adjust your template accordingly.
- Please remove any copyright indicia from your company template so that your presentation can be posted on the AMR website.
- Spell out acronyms and chemical formulas the first time that you use them.
- Add Alt Text to all graphics, tables, and charts.
- Fill out the Properties box for your presentation.

Adding Images to Your Presentation

- Do not copy/paste images into your presentation.
 - On PC: Insert the image using the “Insert/Picture/File name” menu option of PowerPoint rather than copying/pasting.
 - On Mac: Insert the image using “Insert/Picture/Picture From File” menu option of PowerPoint rather than copying/pasting.
- Crop images in an image processing software instead of PowerPoint. Save the images as an external file (.jpg and .png file formats work well).
- Inserting original images into your presentation works best for preserving image clarity. If originals are not available, it may be an indication the image is copyrighted.

Animations and Videos

- Use animated text and/or figures only if absolutely necessary. Unnecessary animations can distract the audience from your message.
- Be aware that animations do not convert to PDF and animated information may not be visible to reviewers or in the final PDF posted on the VTO AMR website.
- Videos do not translate to PDF reliably and will not be posted on the VTO AMR website.

Content Restrictions

- Your presentation is public and will be posted on the VTO AMR website.
- You must include the phrase “This presentation does not contain any proprietary, confidential, or otherwise restricted information” on at least the first slide (you may put on all slides if you wish).
- Do not include any proprietary or confidential information. It is your responsibility to ensure that any subcontractor information is not proprietary or confidential.
- You must remove the copyright indicia on your company template if that indicia is part of the template; otherwise, we cannot post your presentation on the VTO AMR website.
- Your presentation may **not** include any slide that has “Official Use Only” or “Sensitive” or any similar wording, or information that your organization might construe as being in such categories.
- You must include the phrase “Any proposed future work is subject to change based on funding levels.” on all slides with future-looking statements.

Copyright Restrictions

- If you use any copyrighted information or graphics or intellectual property, it must be properly attributed.
- Do not assume subcontractor information may be used without their approval.
- Do not assume that information or images published on a website can be used without permission.
- If you use copyrighted graphics (including copyrighted photos and journal and magazine covers), you must provide written permission along with your submitted file for it to be accepted by DOE for the purposes of the AMR.
- Intellectual property includes copyrighted material, including documents, logos, photos, scripts, software, and videos or animations of any type; trademarks; service marks; patents; and proprietary or confidential information.
- Also see the indemnification statement on p. 7.

Use of Logos

- **Do NOT** use the DOE logo or seal in your presentation. Some examples include:



- **Do NOT** use the EERE slide template.
- If you use corporate logos for organizations other than your own, secure permission for use.

60-, 45-, and 30-Minute Oral Recommended Slide Order

- Title Slide: must include Project ID, name of principal investigator, name of presenter if different, and “This presentation does not contain any proprietary, confidential, or otherwise restricted information.”
- Overview Slide: must include timeline, budget, barriers, and partners
- Relevance
- Milestones (if not included as part of Approach)
- Approach
- Technical Accomplishments and Progress
- Responses to Previous Year Reviewers’ Comments
- Collaboration and Coordination with Other Institutions
- Remaining Challenges and Barriers
- Proposed Future Research
- Summary Slide

Additional slides after Summary Slide:

- Technical Backup Divider Slide
- Technical Backup Slides
- Reviewer-Only Divider Slide
- Reviewer-Only Slides
 - Publications & Presentations
 - Critical Assumptions & Issues

15- Minute Oral Recommended Slide Order

- Title Slide - must include Project ID, name of principal investigator, name of presenter if different, and “This presentation does not contain any proprietary, confidential, or otherwise restricted information.”
- Overview Slide - must include timeline, budget, barriers, and partners
- Relevance
- Approach
- Technical Accomplishments and Progress
- Collaboration and Coordination with Other Institutions
- Proposed Future Research
- Summary Slide

Additional slides after Summary Slide:

- Technical Backup Divider Slide
- Technical Backup Slides
- Reviewer-Only Divider Slide
- Reviewer-Only Slides
 - Publications & Presentations
 - Critical Assumptions & Issues

Preparing your PowerPoint for Web-Publication/PDF

Create your web-ready PDF file (the file that will be published on the VTO AMR website) using the following instructions on the next pages (p. 21-26) to:

- Add Alt Text
- Add presentation detail information
- Create and verify the final PDF

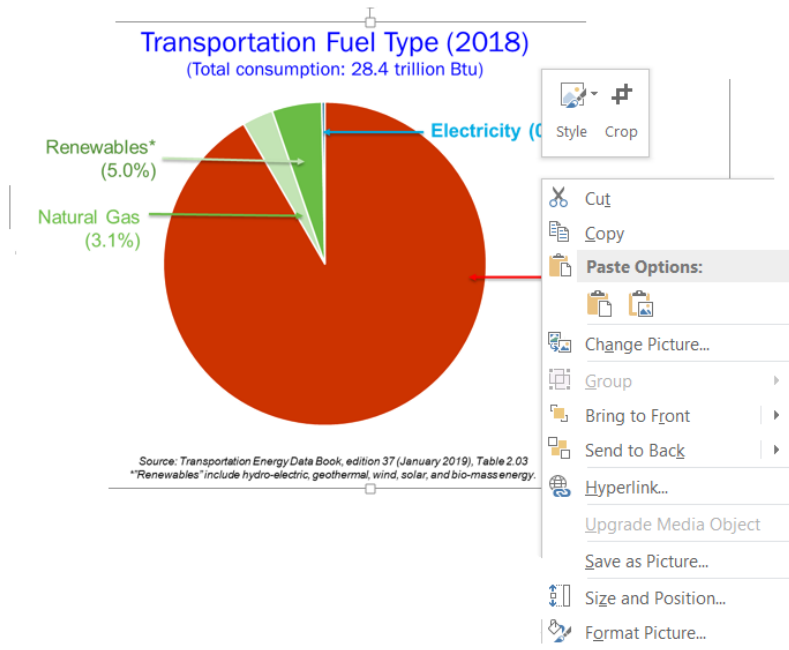
Adding Alt Text to Your Presentation

- You must add alternate text (Alt Text) to key graphics, charts, and tables on each slide.
- Alt Text helps visually impaired people who use screen readers to know what the picture shows.
- Be accurate and succinct. You do not have to say “image of...” or “graphic of...”
- A good Alt-Text example of a picture of a crowd at a basketball game:

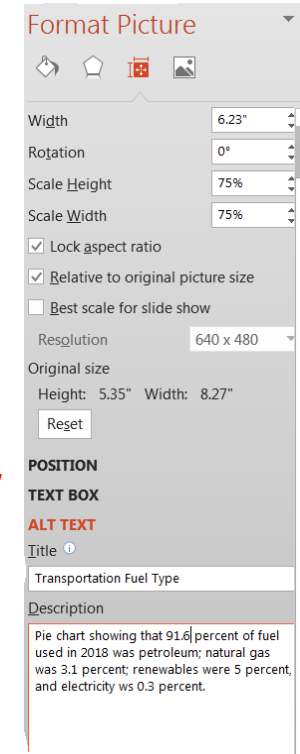
“A large, diverse group of cheering students, standing up, and fist-pumping on the bleachers of a basketball game.”

To Add Alt Text to a Chart, Graph, or Image

Note: These instructions are for PowerPoint 2013. If you have a newer version, you may be able to right click on the graph or chart and select “Edit Alt Text” directly from the menu.



1. Right click on the graph or chart and select “Size and Position...”



2. Select the “Alt Text” option and enter the **Title** and a short brief **Description** of the chart

3. Close the Format Picture pane to return to the PowerPoint slide

Adding Presentation Detail Information

- Under the **File** tab, select **Info**
- Click on “**Properties**” and then select “**Advanced Properties**”

On the “**Summary**” tab of the pop-up window, complete the following fields:

- **Title:** Enter the title of your presentation
- **Subject:** Substitute your **Project ID** into the subject
- **Author:** Enter the **PI Name** and **Company**

- **Save preview picture:** Make sure this box is checked
- Press **OK**

The screenshot shows the Microsoft PowerPoint interface. On the left is the File tab ribbon with the 'Info' tab selected. The main area displays the 'Info' tab for a presentation titled '2021 RD instructions (003) LS (002)'. A 'Properties' dropdown menu is open, showing 'Advanced Properties' selected. A '2021 RD instructions (003)_LS_LR.pptx Properties' dialog box is open, with the 'Summary' tab selected. The dialog box contains the following fields:

- Title: Oral Presentation Guidelines and Examples
- Subject: Project ID, 2021 VTO Annual Merit Review
- Author: Principal Investigator Name, Company
- Manager: (empty)
- Company: (empty)
- Category: (empty)
- Keywords: (empty)
- Comments: (empty)
- Hyperlink base: (empty)
- Template: (empty)
- Save preview picture

At the bottom of the dialog box are 'OK' and 'Cancel' buttons. Red arrows point from the text instructions to the corresponding fields in the dialog box.

Creating Final Version of Your Presentation

- Once your PowerPoint presentation is final, you must minimize your PowerPoint's file size.
- Do this by using the “**Save As**” option to save the final version of your file as a PowerPoint presentation.
- Doing a simple “Save” command will not minimize file size.
- You can “Save As” an existing PowerPoint filename if needed.

Creating PDF Version of Your Presentation

- You are also required to submit a PDF version of your presentation.
- After saving your PowerPoint file using the “Save As” option, save the file as a PDF using the same naming conventions as your PowerPoint file.
 - If you have Adobe Acrobat Pro software, you can use the Acrobat PowerPoint plug-in or select “Save As Adobe PDF” to create your PDF.
 - If you do not have Acrobat Pro, click “Save As” and select “PDF” from the Save As type menu.
- Click the “Options” button in the Save As window and make sure to check the box to enable accessibility tags. Look for text that says “Document structure tags for accessibility” or “Enable accessibility and reflow with tagged Adobe PDF.”
- Click “Save”.
- Select “NO” if asked if you would like to convert the presentation’s speaker notes to text annotations in the PDF.

Verifying PDF File

After you create the PDF,

- Scroll through the document and look at every page to ensure the PDF matches the PowerPoint file.
- Look for missing items from charts, such as legends and axis titles, which sometimes disappear due to incorrect object reordering that can result from the tagging process for accessibility.
- If you do find issues that you're not able to fix, a communications or publishing specialist at your organization may be able to help. Or, you can contact VTAMR@ORAU.org to help troubleshoot the PDF conversion.

Submitting Your Presentation

- You must submit your presentation files to ORISE no later than **APRIL 14, 2023**.
- Submit your presentation to ORISE by filling out [this Google Form](#).
 - Upload your PowerPoint presentation file (.ppt or .pptx)
 - Upload the PDF version of your PowerPoint presentation (.pdf)
 - Submit any changes to title or presenter. Title changes must be approved in advance by your VTO Technology Manager.
 - If you do not have a Google account associated with your email address, follow the steps on this page: [Create a Google Account - Google Account Help](#)

Oral Presentations

- Additional details on the virtual presentation platform will be communicated closer to the event.
- Each session will have a moderator to enforce time limits and facilitate Q&A. Your mic will be muted once you have reached your time limit.

Oral Presentation Time Limits

- Your oral presentation will be 15, 30, 45, or 60 minutes in length as indicated on your invitation-to-present email from ORAU.

| Time slot duration | Presentation duration | Questions | Max. <u>presented</u> slides |
|--------------------|-----------------------|-----------|------------------------------|
| 60 mins | 40 mins | 20 mins | 40 slides |
| 45 mins | 30 mins | 15 mins | 30 slides |
| 30 mins | 20 mins | 10 mins | 20 slides |
| 15 mins | 10 mins | 5 mins | 10 slides |

Time limits will be strictly enforced.

- A PDF version of the presentation slides will be available for attendees to download from the VTO AMR website just before the meeting. This PDF will not include PowerPoint animations, videos, or Reviewer-Only slides.

Late Information Addition

- Information and research updates that become available following the submission of the presentation but before the AMR may be supplied verbally at the time of the oral or poster presentation.
- **No extensions will be granted for presentation submission.**
- Any additional information must still adhere to the time limitations.

R&D Evaluation Criteria

All R&D presentations (oral and poster) follow the same content and design guidelines for reviewer scoring.

| Criterion | Weight |
|---|---------------------|
| Relevance | Adequate/Inadequate |
| Approach | 25% |
| Technical accomplishments | 50% |
| Collaborations and coordination with other institutions | 12.5% |
| Proposed future research | 12.5% |
| Resources | Adequate/Inadequate |

Consider these criteria and weights when creating your presentation!

Slide Titles and Key Results

- **Slide Titles:** Except for the mandatory Title, Overview, and Summary slides, all slide titles and headings should relate directly to the evaluation criteria.
- **Key Results:** The key take-home message for each results slide should be communicated as a banner, header, or bullet.

Instructions for Specific Slides

- The following guidelines provide specific information on mandatory slides and the type of information expected within the criteria guidelines. These instructions apply to both poster and oral presentations.
- **Your presentation should include:**
 - **Title Slide** (mandatory)
 - **Overview Slide** (mandatory)
 - **Review Criterion Slides** (mandatory, one or more slides as appropriate for each review criterion)
 - **Summary Slide** (mandatory)
 - **Technical Backup slides** (optional)
 - **Reviewer-Only slides** (optional)

- **The following slides include:**

Instruction

(Guidance for constructing the specific slides and sections)

Example Slide

(Examples are from previous AMR presentations)

- Include:
 - Project title
 - Name of the principal investigator
 - Name of the presenter if different from the principal investigator
 - Organization
 - Project ID# (which ORAU will provide to you)
 - Statement: “This presentation does not contain any proprietary, confidential, or otherwise restricted information.”

Instruction for all oral presentations, unless otherwise noted

2023 DOE Vehicle Technologies Office Annual Merit Review Presentation

(replace with your title)

P. I. Name (always include)

Presenter Name (if not the P.I.)

Organization


Date

Project ID #

(this will be provided to you)

This presentation does not contain any proprietary, confidential, or otherwise restricted information

Title Slide Examples




EVI-Equity

PI: Dong-Yeon (D-Y) Lee
Fan Yang, Alana Wilson, & Eric Wood
National Renewable Energy Laboratory

2022 Vehicle Technologies Office Annual Merit Review
Project ID: VAN046
June 21, 2022

This presentation does not contain any proprietary, confidential, or otherwise restricted information.



Herbert Wertheim
College of Engineering
UNIVERSITY of FLORIDA

Project ID: mat164

2022 DOE Vehicle Technologies Office Annual Merit Review

Multiscale Development and Validation of the Stainless Steel Alloy Corrosion (SStAC) Tool for High Temperature Engine Materials

PI: Michael R Tonks
Department of Materials Science and Engineering, University of Florida

Team Members:
Simon Phillpot, University of Florida; Adrien Couet & John Perepezko, University of Wisconsin-Madison; Wen Jiang, Idaho National Laboratory; Mark Carroll, TENNECO

June 21, 2022

POWERING THE NEW ENGINEER TO TRANSFORM THE FUTURE

This presentation does not contain any proprietary, confidential, or otherwise restricted information


Project ID:
ace154

Heavy-Duty Hybrid Diesel Engine with Front-End Accessory Drive-Integrated Energy Storage

Chad P. Koci
Caterpillar Inc.
June 22nd, 2022

2022 DOE Vehicle Technologies Office
Annual Merit Review

This presentation does not contain any proprietary, confidential, or otherwise restricted information



Mandatory Overview Slide

- Please prepare an Overview slide formatted and containing the information per the following slide:
 - Timeline (please confirm dates with your DOE HQ/NETL manager(s))
 - Budget (please confirm values with your DOE HQ/NETL manager(s))
 - Barriers (please list up to three technical barriers and technical targets from the most recent U.S. DRIVE Roadmap addressed by your project to be found at: <https://www.energy.gov/eere/vehicles/us-drive-partnership-plan-roadmaps-and-accomplishments>. MAT presenters should use the Light-Duty Workshop Final Report at https://www1.eere.energy.gov/vehiclesandfuels/pdfs/wr_ldvehicles.pdf as their guide. If you don't see a report on your subject matter, please contact the relevant Technology Manager.
 - Partners

Timeline

- Project start date
- Project end date
- Percent complete

Budget

- Total project funding
 - DOE share
 - Contractor share
- Funding for FY 2022
- Funding for FY 2023 (if available)

Barriers and Technical Targets

- List up to three technical barriers and technical targets from the most recent U.S. DRIVE Roadmap relevant to your project. For a list of roadmaps by subprogram, please see the link below:
<https://www.energy.gov/eere/vehicles/us-drive-partnership-plan-roadmaps-and-accomplishments>
- If you don't see a report on your subject matter, please contact the relevant Technology Manager.

Partners

- Interactions/collaborations
- Project lead

Overview Slide Examples

Project Overview

Timeline

Project Start Date: 10/1/2020
 Project End Date: 12/31/2022
 Percent Complete: 75%

Budget

Total Project Funding:
 DOE Share = \$399,449
 Contractor = \$52,403
 FY 2021 Funding = \$150,896
 FY 2022 Funding* = \$67,476


* through 5/1/2022


Barriers Addressed

Heavy-duty commercial vehicle fleet electrification:

- Tools to determine heavy-duty vehicle energy consumption on-route require known vehicle mass, which is typically not measured
- On-route charging is typically required to serve electric heavy-duty commercial fleets
- Predictive models that can use irregularly sampled time-series vehicle data from telematics systems are challenging


Partners





UNIVERSITY OF MINNESOTA
Driven to Discover™

2



OVERVIEW

Timeline

Project start date: 9/1/2020
 Project end date: 9/30/2023
 Percent complete: 50%

Budget

Total project funding: \$12.405 Million
 • DOE share: 100%
 Funding for FY2021: \$4.255 Million
 Funding for FY2021: \$4.075 Million

Partners

Project lead: LBNL
 Partners: NREL, UrbanSim, Inc., Sim Rise
 Collaborators: PNNL, UC Berkeley

Barriers and Technical Targets

(from Vehicle-Mobility Systems Analysis Tech Team Roadmap Feb 2020)

- Analyses of priority research questions:
 - "What does the future of mobility look like?"
 - What are possible future scenarios for how people/goods will move?"
 - How will these impact future R&D portfolios?"
 - What would be the vehicle fleet composition?"
 - What impact will these changes have on energy consumption?"
- Application of integrated modeling workflow, as well as:
 - "Taking a step back from the models themselves to consider how underlying relationships—such as land constraints and implications for where people live, work, and travel—and specific variable assumptions—such as modal travel preferences—are translated from conceptual narrative to model implementation.
 - Input from external experts with complementary perspectives (e.g. land use, city planning) ...solicited..."

Any proposed future work is subject to change based on funding levels.

3

Overview

Timeline

- Project start date: Feb 2020
- Project end date: Sep 2022
- Percent complete: 70%

Barriers and Targets


- Vehicle light-weighting
- Seatback: high-performance requirement due to safety under crash incident
- Replacement of current metal frame with lightweight composite

Budget

- DOE project funding: \$500K
- Partner's in-kind contribution: \$500K

Partners

- Ford Motor Company (Industry Partner)
Lead: Patrick Blanchard



2

Open slide master to edit

- Relevance counts for 10% of your total project score.
- The title of these slides should make it clear that they are your project's **Relevance**.
- Information to include:
 - Describe the objective of your project and what you were to achieve over the past year in the work covered by your presentation.
 - Clearly show **how your project relates to the pertinent VTO subprogram area** and how it will achieve the goals of that area (refer to the subprogram Annual Progress Report goals linked on the next page).
 - Explain how your project will be relevant to
 - Reduction of energy costs
 - Increased energy security
 - Clean energy technology to move people and goods
 - Describe the impact of your project on addressing the barriers identified in the Overview slide and other specific targets and milestones.

You may verbally elaborate on project relevance in addition to what's on your slide.


Relevance (Continued)

VTO Subprogram Goals


LINKS TO 2021 SUBPROGRAM ANNUAL REPORTS

- [Advanced Engine and Fuel Technologies](#)
- [Analysis](#)
- [Batteries](#)
- [Electrification](#)
- [Energy Efficient Mobility Systems](#)
- [Materials](#)

Relevance Slide Examples



Relevance

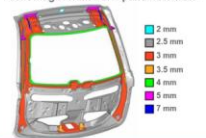


Objective

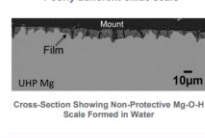
- Perform selective processing to enhance corrosion resistance and improve the wear resistance to address shortcomings of typical commercial magnesium alloy castings
- This thrust will bring together PNNL, ORNL, and ANL to develop scalable and cost-effective processing methods to locally enhance the properties of cast magnesium to enable broader implementation of lightweight alloys in vehicles.

Challenges

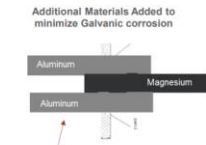
Cast magnesium inner panel-Meridian¹




Poorly adherent oxide scale



Additional Materials Added to minimize Galvanic corrosion



Galvanic Corrosion at the interface of Mg-Steel



Impact

- Improved corrosion resistance and wear resistance will aid in the widespread adoption of Mg components to achieve vehicle light weighting goals

Scientific and Engineering Challenges of Integrating Mg castings into the BIW:

- General and Filiform Corrosion
- Macro Corrosion
- Micro Galvanic Corrosion
- Galvanic Corrosion

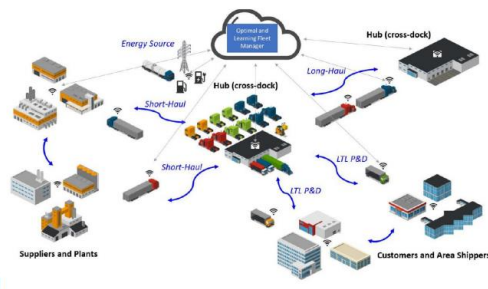
Relevance

Demonstrate $\geq 20\%$ fleet level WTW CO₂ (kg/ton-mile) reduction over a baseline fleet by

- optimal adoption of emerging technologies
 - Advanced powertrain: Hybrid, FC, BEV
 - Connectivity and Automation: L3+, CACC, Tire
- optimal operation using learning fleet optimizer
 - Truck Dispatching, Routing and Scheduling
 - Type (class 6 versus 8) and # of vehicles
 - Charge management
- Minimizing cost/TCO

This will result in

- Paths to $\geq 20\%$ fleet level WTW CO₂ reduction with minimum cost w.r.t. the baseline
- Assess different electrification & CAV scenarios on the path to target
- Learning fleet optimizer software for optimal and resilient fleet operation with emerging MDHD technologies in electrification and CAV




Trucking freight transportation

- is dominant mode of freight shipping in U.S.
- accounts for >20% of transportation energy consumption & GHG emissions.
- projected to grow and adopt electrification, connectivity and automation technologies.

DOE VTO Annual Merit Review (AMR), 2022

Cummins
3

RELEVANCE



First Series Production Freightliner eCascadia leaving the plant

PROJECT OBJECTIVES:

- Develop and demonstrate a fully commercialized Class 7/8 electric tractor with sufficient range and durability to meet the needs of 70% of U.S. freight movement
- Improve performance over baseline prototype eCascadia:
 - increased range up to 250 miles/day
 - increased fuel efficiency of 2.0 kWh/mile
 - increased battery capacity up to 550 kWh
 - reduced curb weight down to ~ 20,000 lbs.
- lighter battery packaging
- enhanced motor design, software, telematics, weatherization, and diagnostic systems custom-designed for electric trucks.

IMPACT

- This project advances state-of-the-art heavy-duty electric truck technologies to full commercialization and provides a platform for the market to reduce:
 - fleet operation, maintenance and energy costs
 - diesel consumption
 - carbon, nitrogen oxides (NO_x), particulate matter (PM) and emissions.

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Milestones

- Milestones may be presented in a separate slide directly before the Approach section or included as part of the Approach section.
- Include milestones and go/no-go decision points for FY 2023 and FY 2024.

Milestones Example Slides

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Milestones:
 We have completed seven tasks and we are now working towards our final goal

Tasks

- 1.1: 1st Experimental campaign
- 1.2: PF model development
- 1.3: Corrosion model development
- 2.1: 2nd Experimental campaign
- 2.2: Mesoscale model development
- 2.3: Implementation of SStAC tool
- 3.1: 3rd Experimental campaign
- 3.2: Validate and apply mesoscale
- 3.3: Release of SStAC tool

■ BP1 Go-No Go: Corrosion model must be within 25% of experimental data
 ■ BP2 Go-No Go: SStAC tool must function in 1D, 2D, and 3D
 ■ BP3 FINAL: SStAC tool must predict corrosion rate with < 10% error

MILESTONES

| Milestone # | Milestone | Date | Status |
|-------------|---|------------|----------------|
| M.1 | Establish the role of experimental conditions in measuring the cathode/electrolyte degradation | (Sep 2021) | Complete |
| M.2 | Develop a new tool for in-operando measurement of cathode/electrolyte decomposition | (Sep 2021) | Complete |
| M.3 | Report on a deep understanding of the interaction of protons (H ⁺) with individual components of the cathode/electrolyte interface, i.e. solvent, cathode material NMC, electrolyte anion | (Dec 2021) | Complete |
| M.4 | Establish a correlation between proton concentration in electrolyte (acidity) and standard coin cell performance (in collaboration with John Zhang (ANL)) | (Mar 2022) | In progress |
| M.5 | Conclude identification of decomposition mechanism of EC | (Mar 2022) | In final stage |
| M.6 | Report on differences in resistance to proton attack/dissolution rates on NMCs of various compositions (111, 622 and 811) | (Sep 2022) | Complete |
| M.7 | Conclude investigation of individual decomposition processes on real cathode materials | (Dec 2022) | In progress |
| M.10 | Conclude identification of decomposition mechanisms of cyclic and linear carbonates | (Jul 2023) | Future work |
| M.11 | Establish a trend-based correlation between experimental and theoretical solvent oxidation potential and alfa-H acidity in cyclic carbonates | (Jul 2023) | Future work |
| M.16 | Establish the magnitude of the impact of impurities in the overall degradation of the interface | (Dec 2023) | Complete |

4

Approach – High Power Charging

High-Power Electric Vehicle Charging Hub Integration Platform (eCHIP)

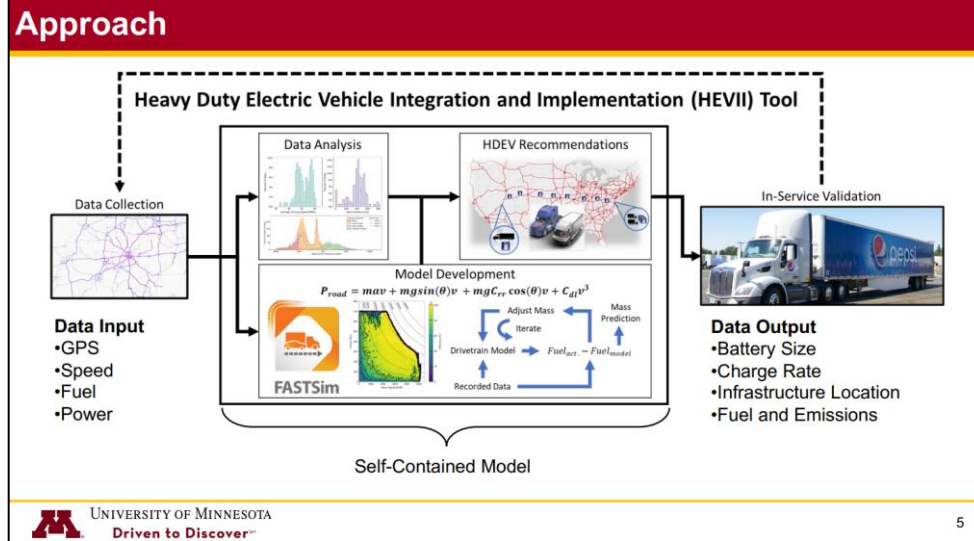
- **Design and Early-Stage Development Tasks:**
 - Scoping Requirements and Industry Stakeholder Engagement
 - DC Distribution and System Architecture
 - Modular DC Universal Power Electronics Regulator (UPER)
 - EV Charging Interface and DC/DC Integration with DC Distribution
 - Station Energy Management and Coordination
 - Grid Interface Inverter and Integration with the Distribution System
 - Charging Facility Evaluation
- **Deliverables:**
 - Identify common charging hub requirements FY22 Q2
 - Identify inverter for DC distribution system FY22 Q3
 - SpEC integration requirements with DC/DC UPER, DC Distribution and Site Management FY22 Q4
 - Develop UPER bench-level subsystem components and demonstrate functionality FY23 Q1
 - Develop a DC distribution system to demonstrate kW charging at a 1+-MW charging hub with COTS equipment FY23 Q1

NREL | 8

Approach

- Approach counts for 20% of your total project score.
- The title of your slides should make it clear that they are your project's **Approach**.
- Describe overall Technical Approach:
 - Emphasize unique aspects of your work and de-emphasize discussion of equipment used.
 - Discuss how your work addresses the project's technical barriers.
 - Describe how your project is integrated with other research or deployment projects within the pertinent VTO subprogram.
 - Use simple statements so that scientists and engineers, not experts in your area, can readily understand the explanation of your approach.
- Include the planned milestones and go/no-go decision points for FY 2023 and FY 2024 and current status towards them (if not shown in a separate Milestone slide).

Approach Slide Examples



Technical Approach

- Reduce Work/Mile on test route
 - Vehicle aerodynamics & tire improvements
 - Reduce losses in engine and accessories
 - Enable engine-off-coasting (EOC) to reduce motoring losses
 - Electrify accessories for EOC
 - Enable 48V hybridization to minimize brake losses
- Enable high Engine + WHR efficiency
 - Maximize efficiency on test route
 - Advanced Cycle Efficiency Manager (ACEM) to favor high load engine operation
- Maximize freight capacity via weight reduced powertrain/truck/trailer

Cummins | 8

APPROACH

Task 1: Enhanced Performance and Deployment

- FASTER TO RUN**
 - Make code more computationally efficient → Faster algorithms, continued refactoring and profiling
 - Require fewer iterations → Get to user equilibrium faster
 - More parallel → Take full advantage of asynchronous agent communications in BEAM, deploy on multi-node HPC
- EASIER TO RUN**
 - SMART 1.0 model runs required manually passing inputs/outputs between many modules
 - Get the human out of the loop → Automate construction and sharing of inputs/outputs between models
- MORE ACCURATE**
 - More consistency between agent decisions at different time scales
 - Land use • Activity planning • Mode/route choice • Fleet operations/Controls • Freight
 - Make full use of all ActivitySim features
 - ActivitySim already widely used in many cities • Allows easy coordination with UrbanSim
- MORE WIDELY DEPLOYED**
 - Currently BEAM is deployed in 4 regions, with BEAM CORE deployment in 3
 - Deploy BEAM CORE in up to 6 new regions

Technical Accomplishments and Progress

- Technical Accomplishments and Progress count for 40% of your total project score.
- The title of these slides should make it clear that they are your project's **Technical Accomplishments and Progress**.
- Each slide should include a summary “take-home” message, especially those that contain data.
- **Describe the most important technical accomplishments achieved during the reporting period and their significance.** Specifically, address last year’s reviewer comments regarding technical accomplishments and progress as well as progress to date for new projects.
- Include relevant data to support your accomplishments.
- Relate the accomplishments to project milestones, barriers, objectives, and technical targets.
- Benchmark the progress versus FY 2022 results, if applicable.

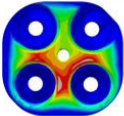

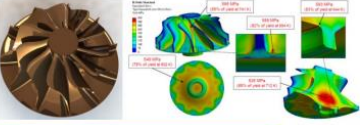

Technical Accomplishments and Progress (Continued)

Instruction

- Include no more than one slide on previous accomplishments and CLEARLY indicate work previously presented versus new work.
- To assist the reviewers evaluating your work, please include bullet comments of the key points on each slide.
- Include sufficient slides to explain what was done leading to the technical accomplishments.
 - However, please limit your slides to the time you have available – 10 minutes for 15-minute presentations, 20 minutes for 30-minute presentations, 30 minutes for 45-minute presentations, and 40 minutes for 60-minute presentations – time limits will be STRICTLY enforced.
- Though your presentation will be in color, it is best to choose colors and data symbols that can be easily distinguished in black and white for those reviewers using hardcopies.

Technical Accomplishments & Progress

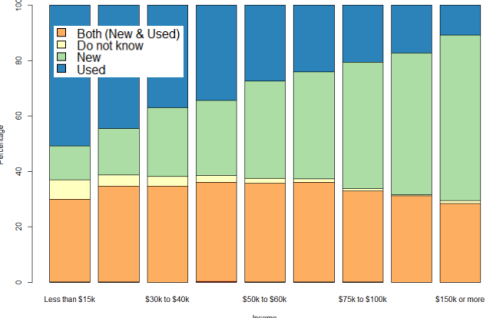
- Go / No-Go #1 – Passed
 - Extensive performance simulation
 - Phase 1 engine testing
 - Extensive load response simulation
 - Single cylinder testing of TBC's
 - Historical technology experience
 - Hybrid packaging assessment
- Go / No-Go #2 – Passed
 - Core engine durability analyses
 - Valvetrain life simulation
 - SuperTurbo turbine durability sim.
 - SuperTurbo drive life simulation
 - Hybrid system durability analyses
 - HSFW fatigue & discharge analyses
 - Supplier component testing

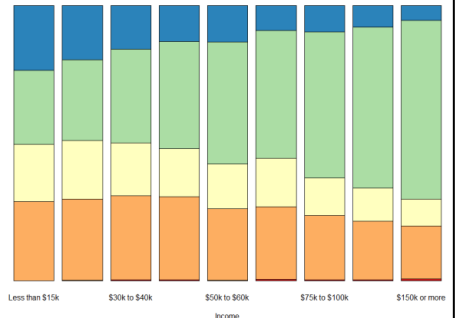
Accomplishment: Community Engagement – Public Survey

- The lower the income, the more likely respondent is to rely on the used vehicle market.
- The relative reliance on the new vs. used vehicle market may vary with technology.
- Possible contributing factors: Concerns regarding the reliability of, or lack of understanding of/familiarity with technology.

When you buy a car, in which market do you usually look for a vehicle?



If you were ever in the market for a plug-in electric vehicle, which vehicle market (new and/or used) would you consider?



NOTE: More than 30 questions were asked about electric vehicles, refueling behavior and preferences, and charging infrastructure. INREL | 6

TECHNICAL ACCOMPLISHMENTS AND PROGRESS

Technical Accomplishments and Progress for Phase 1a

- B-Sample build completed
- B-Sample vehicle testing started in BP 1a and completed in BP 1b
- C-Sample vehicle design components procurement completed

Technical Accomplishments and Progress for Phase 1b

- Target Vehicle Metrics Achieved for C-Sample build
- Final Assembly of C-Sample completed
- Finalization of Data List to be Collected and Analyzed (DVP)
- Finalization of Design Elements
- C-sample vehicle range targets achieved
- D-Sample vehicle components procurement completed
- D-Sample development supplier selection completed

Technical Accomplishments and Progress for Phase 2

- Production tests for customer ready parts manufacturing process started
- Production of customer ready parts in process D-Sample development supplier selection complete



First Series Production Unit Built at Portland Plant

Key Takeaway: The project team achieved critical project milestones for Phase 1a and Phase 1b during Budget Period 1 and Budget Period 2

Phase 2: Deployment and Demonstration is underway and on track to be completed in December 2022.

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Responses to Previous Year Reviewers' Comments

- All VTO AMR reports are posted on the VTO website along with Annual Progress Reports at <https://www.energy.gov/eere/vehicles/annual-progress-reports>.
- Last year's presentations can be found at: <https://www.energy.gov/eere/vehicles/annual-merit-review-presentations>.
- **If your project was not reviewed last year, please indicate as such on the slide.**

Response to Previous Comments

This is the first AMR during which this project is up for review

RESPONSE TO PREVIOUS YEAR REVIEWER COMMENTS



Open Source Strengths versus Challenges and How Those Relate to Technology Transfer and Potential End-Users:

Reviewers recognized the positive nature of the open-source approach, but underscored the challenges in making an open-source platform sustainable and documented sufficiently well to be used. There were related comments regarding who should or could be encouraged to use the tool, and whether MPOs would be willing to replace their own tools with something this complicated.

- The team recognizes the challenges of an open-source approach in terms of maintaining useable foundation product. A lot of focus is on development, but the team will soon turn to extensive documentation to improve usability. The model system is designed to be modular, so that planners could use subcomponents of BEAM CORE without having to use the full system (for example, MPOs have expressed interest in ATLAS and FAMOS). The value of the tool being open source is undeniable, as collaborations with and user groups in universities have already resulted in new functionality that has benefited all users. Additionally, the model is very complicated, and enabling an open-source-facilitated user base in universities results in graduate students that are trained in and familiar with the model that can be hired by the national labs and potential other users of the system. This helps perpetuates and strengthens the user community over time. The intension is not necessarily to have MPOs wholesale adopt BEAM CORE at this stage. That may be something that can be worked towards, but is unrealistic at this point in time. One comment noted recent updates had not been committed to GitHub and encouraged frequent committing. We agree with this and have been doing so. Increased focus on cleaning up a stable user-facing version as model development levels off is a priority for upcoming phases of the project. At this stage, engagement with stakeholders outside the U.S. is welcome, though not being prioritized by the team due to bandwidth constraints.

Validation

Some reviewers wanted to see more and better documented validation

- The technical backup slides show all of the validation results to-date. This is an ongoing and multi-phased process where individual modules are internally validated (both in and out-of-sample) based on estimated results, then modules are integrated and calibrated to function in the BEAM CORE system, then externally validated again. Some modules are performing extremely well at this stage, while others require further calibration and updating. This is an ongoing process and a priority for the team and documentation this will be made available as a stable user-facing version of the model is prepared.

Response to Previous Year Reviewer's Comments

Can DTNA EMG provide technical details about the technology used to address the diverse climate conditions the vehicle will operate under (hot/cold) and address EV range loss relative to heating, ventilation, and air conditioning requirements?

The cab HVAC and batteries are on an independent cooling/heating circuits. Drivers can use a preconditioning option to "wake up" the vehicle ahead of time and give the batteries adequate time to reach the optimal temperature.

The range effect will vary based on whether the vehicle is plugged into charge. DTNA is collecting test data to determine the exact conditions that affect the range.

What regulatory approvals are required prior to production release date?

- FMVSS -Brakes, defrost, etc.
- EPA -OBD, Noise, AC Leakage
- FMCSR-Ingress/egress, etc.
- MBN LV123 -HV Components
- ISO 26262 -Functional Safety
- UN ECE R100/2 -HV Components
- UN/DOT 38.3 -HV Battery
- CARB ZEV & HVIP

The C-sample build and go/no-go approval are both shown to occur in the same month.

Is enough time allotted for testing the hardware and software?

The criteria for go/no-go is set. However, the validation of those criteria will come before D-sample.

Software will be continuously tested to SOP with quarterly cycles.

Durability and Endurance testing is scheduled to be completed by June 2022.

Collaboration and Coordination with Other Institutions


Instruction


- Collaborations and Coordination with Other Institutions count for 10% of your total project score.
- The title of these slides should make it clear that they are your Collaborations and Coordination with Other Institutions.
- List your project collaborators, indicating:
 - Relationship (for example, prime, sub, etc.)
 - Industry, university, National Laboratory
 - Within or outside VTO
 - Extent of the collaboration
- Describe the quality of collaborative relationships and their importance in achieving the project's objectives.


Collaboration Slide Examples

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Collaboration and Coordination with Other Institutions

 Developing macroscale SStAC tool, carrying out laboratory corrosion experiments and analyzing corroded samples

 Finishing implementation of SStAC tool in MOOSE





 Providing engine valve material, sample preparation, and carrying out engine testing

We meet monthly as a team with more frequent interactions between specific team members

COLLABORATIONS

ANL, CSE: Zhengcheng(John) Zhang,
Dr. Zhang is supplying us with clean fluorinated electrolytes,
performing NMR measurements and evaluating performance of
coin cells.

Collaboration with Other Institutions

-  **Venture Logistics**, Support with insights on fleet logistics and operation, constraints and requirements for optimization and data collection to characterize the fleet operation and testing of the algorithms.
-  **Argonne National Laboratory**, Support with the POLARIS-SVTrip-Autonomie fleet simulation models under different scenarios. Furthermore, Argonne is supporting fleet optimizer integration with POLARIS.
-  **University of California Berkeley**, Support with the development and integration of innovative stochastic and learning algorithms for fleet optimizer.
-  **Michelin North America**, Quantify the improvements in energy savings when accounting for information in real time about the tire locomotion capabilities and resistance to motion forces as a function of the vehicle operating conditions.

Remaining Challenges and Barriers

- Highlight the key remaining challenges and barriers to meeting the project objectives.
- The remaining challenges and barriers should provide justification and support for the future plans in the following slide.

Barriers and Challenges

Slide Examples

Remaining Challenges and Barriers

- Completion of the final validation testing is underway and on schedule, but lower priority items have been shifted later in the test plans to prioritize the full hybrid system testing. This is due to the high new content and complexity of testing the system.
- The validation testing of the Advanced Engine Controls impact on system efficiency has yet to be quantified and has been eliminated in favor of successful L5 hybrid controls efforts. This is due to resource constraints and hybrid-engine interaction complexity. Only simulation will be used to assess the Advanced Engine Controls.
- Final quantification and documentation of the predicted efficiency improvement ranges remains to be completed.

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CATERPILLAR

REMAINING CHALLENGES AND BARRIERS

- The complexity of the cathode/electrolyte interface is high even on the model systems*
- Identify electrode material / electrolyte couples that exhibit predominant degradation processes, such that the chemistry and/or the electrochemistry of the individual components can be isolated*
- Bridge the gap between theoretical predictions and experiment*
- If individual interface components' electrochemistry can be isolated, we can bring it much closer to computational efforts*
- Bridge the gap between model and real systems*
- By understanding the chemistry/electrochemistry of individual components on model interfaces and gradually increasing the complexity of the system, we hope to better understand the real one*
- Further develop tools for the analysis of the interface, especially for the soluble degradation products*

Argonne
NATIONAL LABORATORY

Remaining Challenges and Barriers

- **VGI/SCM:**
 - EV adoption will expand rapidly though grid planning for this new load, and SCM strategies that account for vocational needs and differences are lacking
 - There is a lack of enabling technologies for smart charging in a utility environment.
- **High Power Charging:**
 - Validation of megawatt-scale charging facilities for charging up to 1+ MW with medium voltage interconnection is needed to demonstrate enabling technologies
 - Efficient, low-cost, and high-power-density DC/DC for 1+MW charging are limited
- **Wireless Power Transfer:**
 - Durability of ground side charging systems in full-scale asphalt surfaces is unknown
 - Validation of high-power dynamic wireless systems real-world conditions are limited
- **Cyber Security:**
 - Industry implementation and utilization of latest security methods is not consistent
 - Lack of methods to identify, protect, detect, respond, and recover from cyber events
 - Limited training for the EV charging infrastructure cybersecurity workforce
- **Codes & Standards:**
 - Standards don't exist for MCS charging connectors, chargers, and site equipment such as DC distribution and protection, as well as grid interconnection

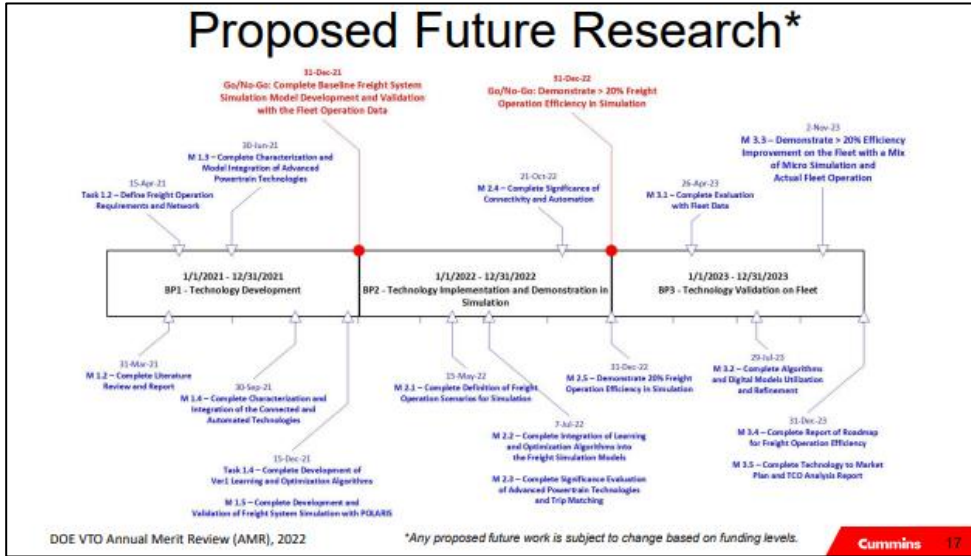
NREL | 21

Proposed Future Research

Instruction

- Proposed Future Research counts for 10% of your total project score.
- The title of this slide should make it clear that the slide shows your Proposed Future Research.
- Explain what you plan to do during the rest of this year (FY 2023) and next year (FY 2024). Provide justification for future plans.
- Add the statement to all slides with future-looking statements, “Any proposed future work is subject to change based on funding levels.”
- Be as specific as possible; avoid blanket statements.
- Highlight upcoming key milestones.
- Address how you will deal with any future decision points during that time and any remaining issues or barriers, including any alternative development pathways under consideration to mitigate risk of not achieving milestones.

Future Work Slide Examples



Proposed Future Research

- Finalize the engine-only and full-system hybrid validation testing
- Document steady-state and transient performance, emissions, and efficiency
- Complete the technoeconomic analysis leveraging the validation data
- Conclude the project with final reporting

| Item Title | Item Description | Start Date | End Date | Phases | | | | | | | | | | | | | | | | |
|--|--|------------|------------|--------|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|--|--|
| | | | | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 | Q13 | Q14 | Q15 | | |
| Connecting, Project Kick-off, Project Management | | | | | | | | | | | | | | | | | | | | |
| Concept Design and Simulation | | | | | | | | | | | | | | | | | | | | |
| Decision Point 1 | If 2D system level simulation validates that the target total fuel consumption reduction AND the CO ₂ emissions AND the power system can be packaged in the target off-road machines, THEN proceed to Task 3. | 6/1/2019 | 6/30/2020 | | | | | | | | | | | | | | | | | |
| Major Subsystem Analysis & Specification | | | | | | | | | | | | | | | | | | | | |
| Decision Point 2 | If the structural dynamics simulations show that the target 12,000-hour durability can be achieved AND the subsystems demonstrate required performance on bench tests, THEN proceed to SF-3.1. | 9/1/2019 | 12/31/2020 | | | | | | | | | | | | | | | | | |
| Hybrid Engine System Build & Integration | | | | | | | | | | | | | | | | | | | | |
| Engine Integration & Assembly Complete | | | 12/31/2021 | | | | | | | | | | | | | | | | | |
| Hybrid Engine System Validation | | | | | | | | | | | | | | | | | | | | |
| Hybrid Engine System Performance Validation Complete | | 9/30/2021 | 6/30/2022 | | | | | | | | | | | | | | | | | |
| Technoeconomic Analysis and Documentation | | | | | | | | | | | | | | | | | | | | |
| Documentation Complete | | 4/1/2022 | 6/30/2022 | | | | | | | | | | | | | | | | | |

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Proposed Future Research

To be completed in FY22 and FY23:

- Collect and receive electric vehicle (EV) data from Pepsico
- Validate HEVII tool with EV data
- Implement 30 second 1 Hz telematics for physics model-based mass algorithm
- Use HEVII tool with secondary dataset from additional fleet
- Refine code and publish in accessible repository



Future*:

- Seeking to further refine the tool to other vehicle data sets and to create an accessible graphical user interface on a website for fleets to use

*Any proposed future work is subject to change based on funding levels

Mandatory Summary Slide

- Summarize the key points you wish the reviewers and the audience to take away from your presentation.
- For those projects that are working toward specific technical targets, include a Summary Table summarizing key technical results to date in FY 2023 compared to FY 2022 results and the technical targets.

Summary Slide Examples



Summary

Three-year enhancement, expansion and application of integrated transportation modeling capabilities

- **BEAM CORE strengths:** open source, transparent, widely deployed, powerful integrated simulation tool. Specialization in long-term scenario analysis: in it's final form, BEAM CORE will include dynamic lifecycle event based demographic evolution driving household vehicle fleet and residence and work location choices integrated with transportation system simulation including traditional and emerging modes, multiple vehicle technologies (electrification, CAVs), energy modeling, and powerful accessibility metrics, including MEP and INEXUS (see EEMS099), enabling unique equity analyses
- Streamlined and more closely coupled model integration will reduce runtime
- **New capabilities being built from scratch:** household demographic evolution, vehicle ownership modules, firm evolution and freight/goods delivery modules
- Expansion to new regions underway
- Series of engagements with stakeholders to inform priorities and scenarios and development of a higher-level planning tool (**BEAM CORE ACT**) for use by local practitioners and other stakeholders
- Design of large scenario and sensitivity analyses and deep dive studies to understand the impacts of new technologies and services on mobility and energy use over time in diverse areas of the U.S.
- All efforts are largely on track



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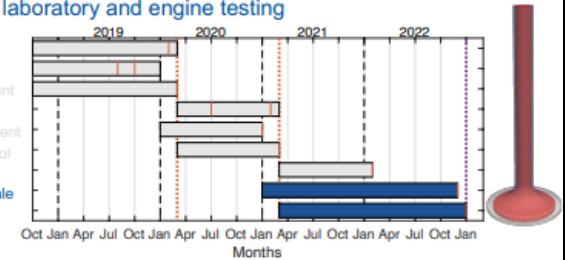
DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING

Summary

- The Stainless Steel Alloy Corrosion (SStAC) tool will
 - Be open-source, based on the MOOSE framework
 - Include impact of microstructure and alloy composition from lower length-scale simulations
 - Be validated using new data from laboratory and engine testing



- Tasks**
- 1.1: 1st Experimental campaign
 - 1.2: PF model development
 - 1.3: Corrosion model development
 - 2.1: 2nd Experimental campaign
 - 2.2: Mesoscale model development
 - 2.3: Implementation of SStAC tool
 - 3.1: 3rd Experimental campaign
 - 3.2: Validate and apply mesoscale
 - 3.3: Release of SStAC tool



SUMMARY

Key Takeaway: Despite the challenges and barriers outlined in this presentation, DTNA EMG remains on track to develop the fully commercialized, all-electric Class 7/8 day cab tractor with improved range, efficiency, durability and performance. The project team has passed critical milestones and technical progress to date is summarized in the table below.

| PHASE | STATUS |
|---|-----------------------------|
| Phase 1a: Vehicle Design and Specification | Completed |
| Phase 2b: Research, Design, Building and Commissioning: Commercial Scale Production Model | Completed |
| Phase 2: Development and Deployment | Underway |
| Start of Production Tests/ 100% of Parts are Customer Ready | (In Progress) November 2021 |
| Start of Commercial Series Production | (Complete) January 2022 |
| Vehicle Delivery and Demonstration Initiation | (In Progress) June 2022 |
| Data Evaluation, Measurement and Verification | December 2022 |

Technical Backup Slides

Instruction

- Please include a “divider” slide if you are including backup technical slides (**maximum of five**).
- These optional backup technical slides will be available for your presentation and will be included in the web PDF files released to the public.

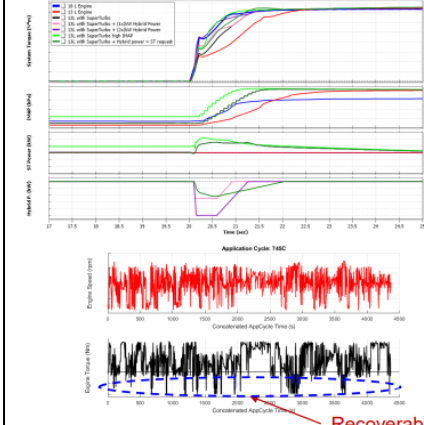
Backup Slide Examples

Technical Backup Slide: Driving Distance and Vehicle Ownership

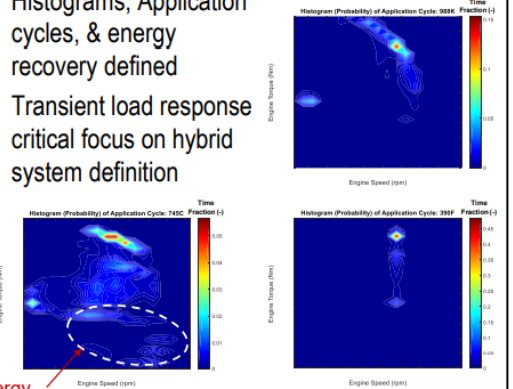
- In general, lower-income households travel less (frequency or distance) and own smaller number of vehicles.
- On a per-vehicle basis, average daily driving distance (when driven) is a little shorter for low-income (40 vs. 50 miles/day).
- On a per-household basis, average daily total travel distance is much shorter for low-income (50 vs. 150 miles/day).
- The number of vehicles per household increases with household income but decreases with population density.
- About 20% of households, with \$25k-or-less of annual income, or in highly-populated areas, do not own personal vehicles.



Technical Backup (2) – From 2020 AMR



- Histograms, Application cycles, & energy recovery defined
- Transient load response critical focus on hybrid system definition



Recoverable Energy

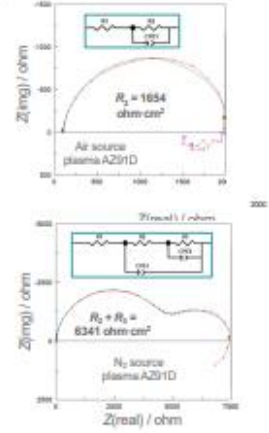


Impedance data- Plasma Treatment



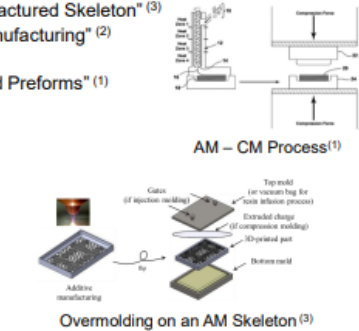
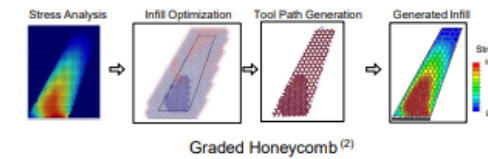
| Sample | Plasma feeding gas | Plasma cover gas | Nozzle distance | [EIS] corrosion reaction resistance (ohm-cm ²) |
|-------------------------|--------------------|------------------|-----------------|--|
| Ref: 600 grit SC finish | n/a | n/a | n/a | ~2800 (Avg.) |
| APS | Air | Open to air | 1" | ~1650 |
| N2-1 | N ₂ | Open to air | 1" | ~6341 |
| N2-1.5 | N ₂ | Open to air | 1.5" | ~6412 |
| N2N2-1 | N ₂ | N ₂ | 1" | ~1444 |
| N2N2-1.5 | N ₂ | N ₂ | 1.5" | ~1950 |

After 1 h immersion in 3.5% NaCl



Relevant Invention Disclosures/Patents

- UT-Battelle (UT-B) Invention Disclosure (ID) No. 4121, "Rapid manufacturing of tailored preforms"
- UT-B ID No. 3152, "Large Scale Polymer Additive Manufacturing and Carbon Fiber Layup Integration"
- UT-B ID No. 3151, "Method and Materials for Large Scale Polymer Additive Manufacturing"
- UT-B ID No. 201804272, "A Method for Rapid Manufacturing via Non-stop and Continuous Deposition in Additive Manufacturing by Adding Bridges in Toolpath"
- UT-B ID No. 202004563, "Overmolding on an Additively Manufactured Skeleton" ⁽³⁾
- UT-B ID No. 201904506, "Graded Honeycomb for Additive Manufacturing" ⁽²⁾
- UT-B ID No. 4278, "Manufacturing of insert skins for tooling"
- Patent US 2020/0023556 A1, "Rapid Manufacturing Of Tailored Preforms" ⁽¹⁾



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Instruction

- These optional slides may be included in your submission but will **not** be part of your oral presentation – they will be provided to reviewers only. These optional slides will be removed from the presentation file and the web PDF files.
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Publications and Presentations

- List any publications and presentations that have resulted from work on this project.
- Use at least 12-point font.
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Critical Assumptions and Issues

- Address three to five critical assumptions and/or problems affecting the outcome of your project. Briefly describe the problem as well as potential solutions, both within and beyond the scope of the project.
- Exclude funding issues.

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Questions?

Contact us by email:
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