TMC24

ATA'S TECHNOLOGY & MAINTENANCE COUNCIL

ANNUAL MEETING
& Transportation Technology Exhibition

MARCH 4-7, 2024 | NEW ORLEANS, LA
ERNEST N. MORIAL CONVENTION CENTER

Quality Spec'ing for Optimal Performance

Total Cost of Ownership Calculator for Class 7 & 8 Electric Vehicles Task Force

3/4/2024

David Black

Chairman

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- In accordance with TMC Board Policy, all personal phones without a silent feature must be turned off during business sessions.
- If you must use your phone —please leave the room!

ATTENTION PLEASE

- This is an open meeting of the Technology & Maintenance Council, held in accordance with ATA Antitrust Guidelines which are listed in your meeting packet.
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- To minimize the possibility of antitrust problems, the guidelines detailed in your registration packet should be followed at all TMC meetings, task force and study group sessions.
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Constructive Comments Are Always Appreciated!

- TMC welcomes your comments, but please make certain that they are constructive and appropriate before you turn in your evaluation sheet!

- *Thank You for Your Cooperation!*

Be Sure to Rate This Session

- Please rate technical sessions/mini-technical sessions via the ATA Events Mobile App. Click the RATE EVENT button from within the session listing under the Events Tab.

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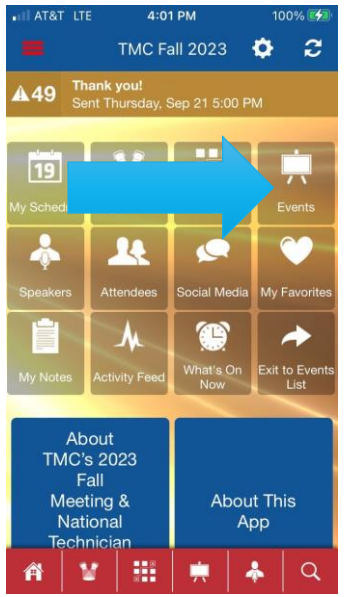

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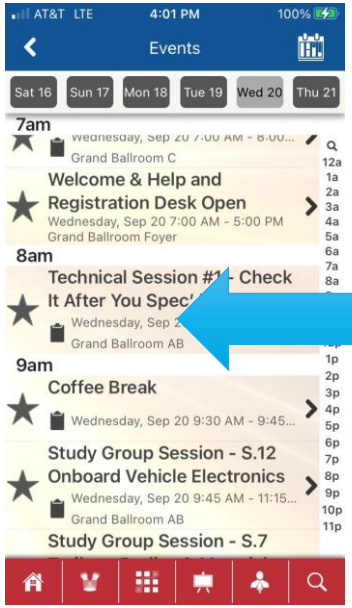

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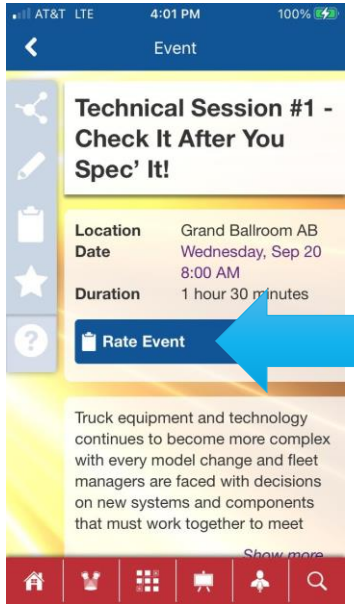

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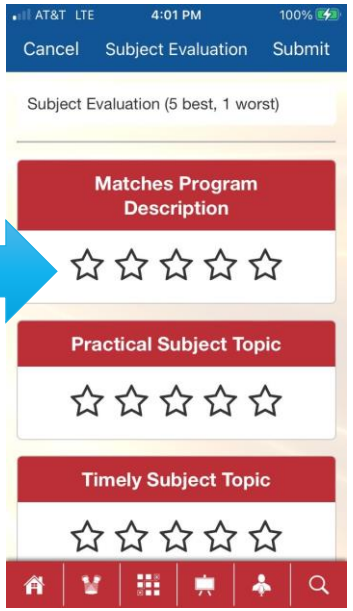


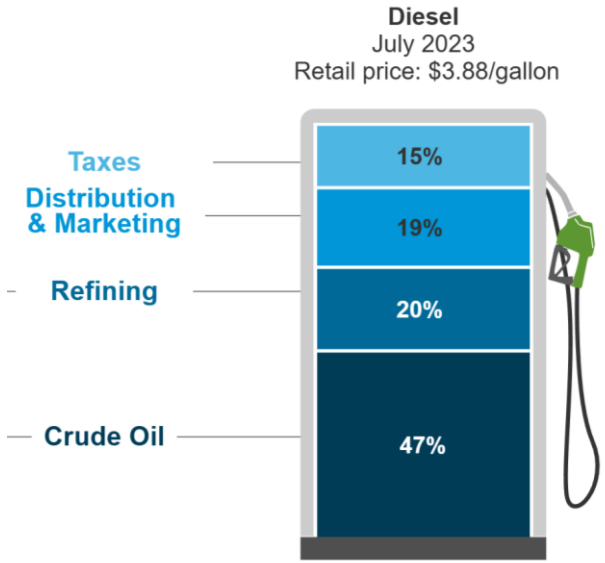
Task Force Agenda

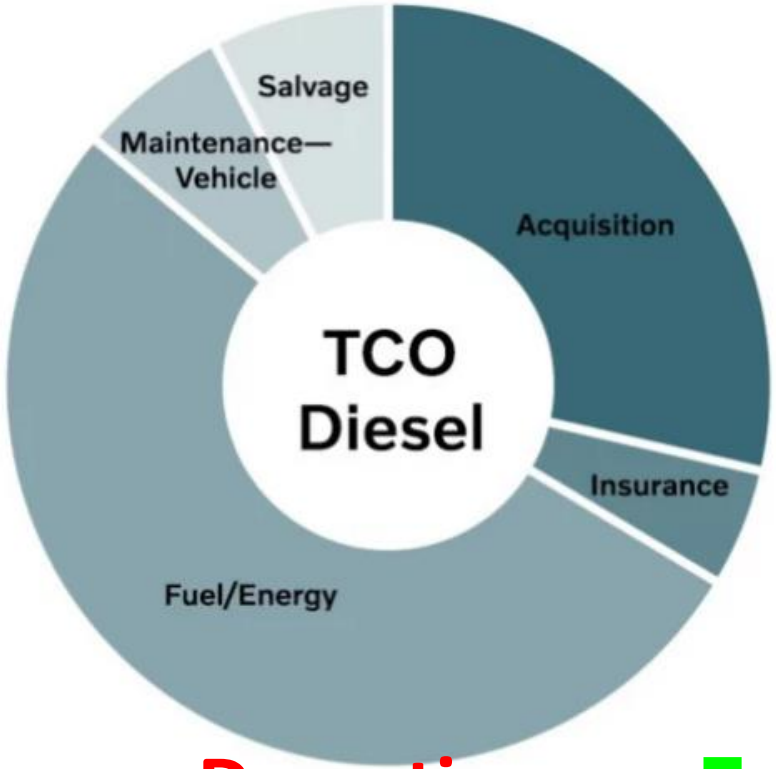
- 1. Introduction/Opening Remarks
- 2. Prior Minutes Approval/Old Business
- 3. Background-Hard Costs/Soft Costs (roll-up)
- 4. No One Size Fits All Calculators
- 5. Goldilocks And The TCO Calculator
- 6. Cradle-to-Grave Model
- 7. Develop Recommended Practice To Utilize Existing Calculators
- 8 Outline Considerations For Assignment
- 9. All Unknowns-We Need Your Help-Sign-Up Today
- 10. Special Thanks

TMC S.11 EV TCO
Recommended Practice Background

Many Factors May Now Be In Your TCO Calculations

Total Cost of Ownership Is In The Details





No free rides *– you pay for infrastructure with diesel too, it's buried in cost of fuel*

− Downtime Costs

+ Incentives & Credits

No one-Right TCO Calculator

- MANY TCO Calculators Exist
- None That Reflect A Comprehensive Cradle-To-Grave Analysis
- Range in complexity and usefulness depending on your needs
- Accuracy Is Somewhat Driven By Input Requirements; Less Input=More Assumptions And Projections Within The Calculator vs. Reliable Proven Data
- The key is understanding your current operations in numbers, considering all the real cost factors you need and want to consider
- Then finding the right tool, that has been vetted by other independent users, and using it for your specific duty cycles
- **Decision:Short-Term-generate recommendations for factors to be included in any existing TCO Calculator-Use those recommendations as a roadmap to build our own TMC CALCULATOR and provide short-term guidance for fleets.**

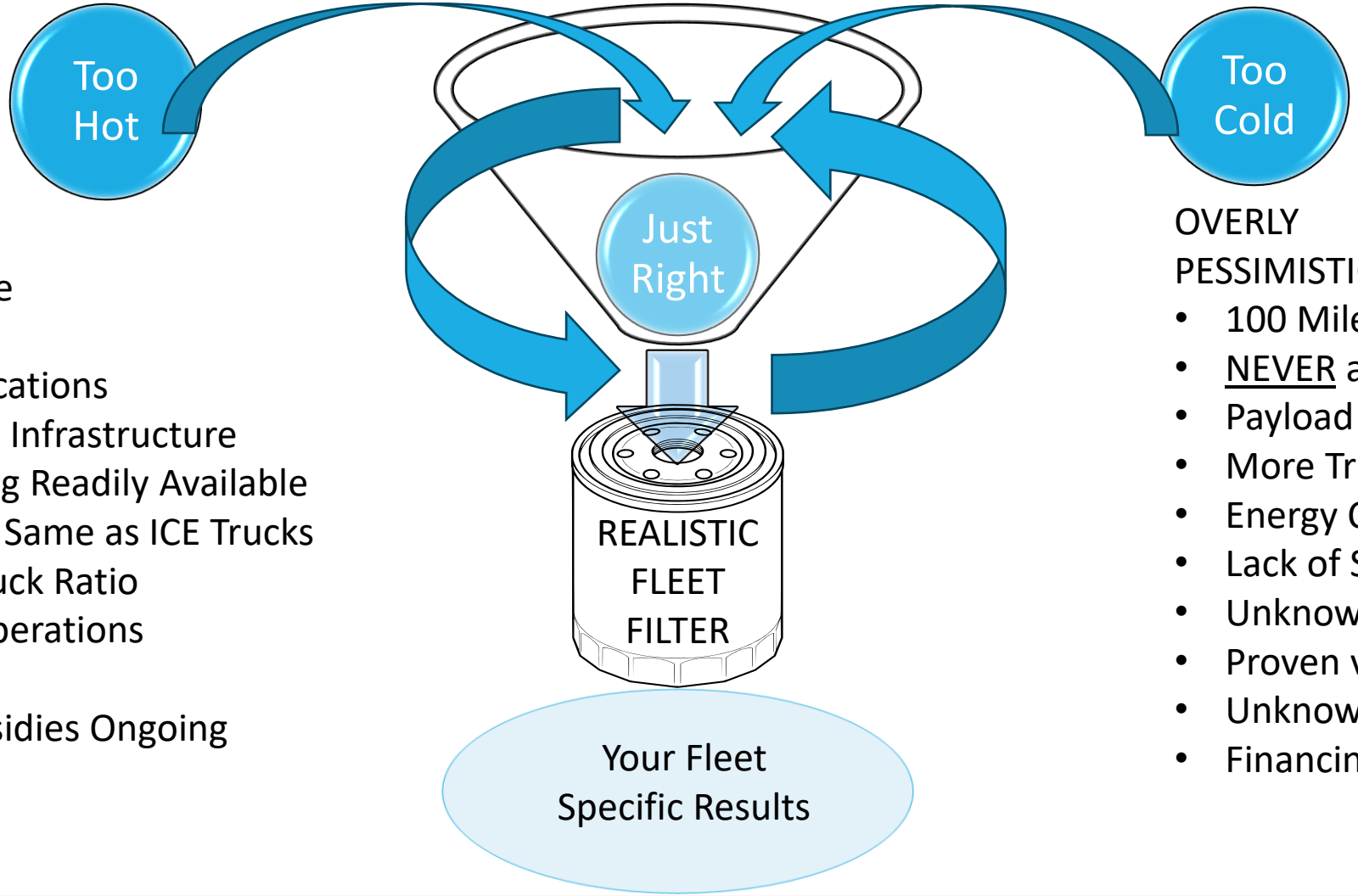
What We Need? Unbiased Approach!

- TMC S.11 – BEV Calculator

- **What is it?** It's a Life Cycle Cost Analysis Tool – or TCO Calculator. ***Must decide what this will ultimately be for TMC.***
- **What's different from all the other calculators out there?** (Everyone has one or at least says they do.) All the other calculators are looking at Operating Cost of a BEV - not the total life cycle cost. (*Cost of fuel* - diesel vs. electricity and *M&R expense* - diesel vs. EV) ***This can compare total cost, including financing, over specific term.***
- **Unbiased Approach** – Most calculators come from the OEM and push towards going green. OEM's are trying to convince the end user that the specific asset they are modeling is going to be less expensive to operate compared to its diesel equivalent. Our goal should simply be comparing diesel vs. BEV for a specific term without trying to force anyone down a certain path. If you go into an analysis with a bias towards one fuel or another, you are likely to manipulate the analysis to match your bias.
- **How are you going to pay for it?** Financing is going to be key. Nobody wants to drop a bunch capital on these trucks and take risk with so many unknowns. Uncertainty creates risk. You need to know what the RV, residual value, may be at a given term. You should mix diesel with BEV when making a purchase.
- **Battery Avg kWh** = 300 (Avg of all major OEM battery capacity) – Currently on the market
- **Avg Range per charge of 300 kWh** = 150 miles – Nothing proven BEYOND that
- **Mileage** – Why 65,000 mi default? 250 mi max range per day x 5 days/wk x 50 weeks/yr rounded to nearest 5,000 = 65,000 miles
- **Grant/Subsidy** – Calculator includes ability to add a grant which uses avg 45% reduction in OEC
- **Charger Cost** – Ability to include cost of charger (single/multi) – Avg cost of a charger single is $55k, can be Capitalized.
- **Cost of Energy** – Cost to charge the battery is dependent on State of operation, so it included cost per kW by state on an average cost. Meaning all hours, peak demand to lowest demand.
- **Tires** – M&R cost includes tires.
- **What about OEM?** The approach is agnostic to OEM. The assumptions use avg OEC, Battery Capacity, and Range for KW, PB, FRT, and Volvo.

- Weight Day Cab
  - ICE Avg 15,500lb to 17,500lb
  - EV Avg Traditional (FRT, Volvo, Mack, Int, Etc…) 22,000lb to 23,000lb
  - EV AVG Non-Traditional (Tesla, Nikola)28,000lb to 31,000lb
- Batt cost Replacement Avg $35,000 – After 7 to 10 years of use.
- R&M EV 25% less than ICE
- Some states allow a 2,000lb weight allowance
- Opportunity charging is recommended to extend range

GOLDILOCKS AND THE TCO CALCULATOR FOR EVs



OVERLY OPTIMISTIC

- 1200 Mile Range
- All EVs by 2030
- All EVs All Applications
- Fully Developed Infrastructure
- Remote Charging Readily Available
- Insurance Costs Same as ICE Trucks
- 1:1 EV to ICE Truck Ratio
- No Impact to Operations
- No HOS Impact
- Grants and Subsidies Ongoing

OVERLY PESSIMISTIC

- 100 Mile Range
- NEVER all EVs
- Payload Reductions
- More Trucks to Move=Freight
- Energy Costs by State
- Lack of Standards
- Unknowns vs. Proven Tech
- Proven vs. Projected
- Unknown Residuals
- Financing Obstacles

CRADLE TO GRAVE CALCULATORS

- Few if any exist due to lack of sufficient data (Proven vs. Projected)
- Lack of Residual Value Negatively Impacting Ability to Borrow, Purchase/Amortize Unless Residual Assumed to be $0.00
- Technology Changing Rapidly and Without Well Established Standards
- **Financial Institutions Consider Residuals and Investments a Poor Risk**
- Alternative Financing Avenues Must be Considered
- Unknown Useful First-Life of Equipment
- Unknown Second Life, If Any, (Battery Replacement/Degradation/Compatibility with Trucks and Chargers, etc.)
- Unknown resale value/disposal costs
- Unknown Infrastructure Maintenance Costs
- Insufficient data for insurance underwriting

TCO CLASS 7&8 BEV CALCULATOR RP OUTLINE

Worksheets -Determine Appropriate Units of Measure, Volume and Range For Each Line Item

- Infrastructure Planning (J.Miller, Volvo)-S.11 Task Force Developing Charging Station Infrastructure
- Infrastructure and Charging Development (J. Miller, Volvo) S.11 Task Force
- Infrastructure Maintenance (J.Miller, Volvo; P.Westlake OUC) TCO Task Force
- Fire Safety
- Operational Planning /Operational Demands & Requirements
- Duty Cycles (Charge Cycle Optimization & Energy Management)
- Vehicle Weights (Range)
- Management for EV Deployment (Specing Expectations & Guidlelines) P. Seeburg
- OEM Decision and Compatibility to Infrastructure
- Purchase/Lease/Financing Options; Residual Value for Trade, Second Usefule Life or Salvage Assumption
- Grants/Subsidies (Range)
- Energy (Charge Cycle Optimization & Energy Management) T. Darakos S.11
- Understanding Battery Capacity (Range)
- Average Range Per Charge i.e 300 kWh=150 Miles
- Charging Times/Options/Etc./Wireless EV Charging (M. Masquelier S.1) Microgrids & Battery Storage J.Younce &A.Lesesky S.1 & S.11 Joint)
- Utility Costs By State/geographic location/demand charging/etc.
- Charging Downtime
- Energy Efficiency Testing Procedure (B. Wilson S.11)

TCO CLASS 7&8 BEV CALCULATOR RP OUTLINE Con’t.

- Supplemental Vehicle Needs
- Insurance (Range)
- Driver Wages & Benefits (Range) ; EV Pre-Trip Requirements (R. Johnson S.5)
- Taxes & Fees (Range)
- Licenses & Permits (Range)
- Tolls (Range)
- Depreciation Methodology Options
- Contingencies
- Maintenance
    - Shop Bay Planning and Layout (S.16 H. Hogg)
    - Parts (Range)
    - Fluids (J.Long S.3 Engine) –B.Stewart –EV Lubrication
    - Labor & Fringe Benefit Costs (Range)
    - Tires –Range- (D.Shy S.2 Tire & Wheel)
    - Brakes-Range
    - Training
    - Systems Hardware, Diagnostics and Software
    - Battery Replacement Costs (Range)
    - Waste Management
    - Compliance Reporting

All Unknowns Must Be Populated

- Data is Desperately Needed From All Stakeholders And Current EV Users
- TMC S.11 Leadership Will Assure Anonymity to Data Providers and Their Companies
- Alternative…. POPULATE THE COSTS USING THE SWAG SYSTEM IN AN INDUSTRY WHERE MARGINS ARE ALREADY RAZOR THIN AND SPECULATION AND UNCERTAINTIES MAY MAKE THE DIFFERENCE BETWEEN BEING IN BUSINESS AND LOSING EVERYTHING!
- WE NEED YOUR HELP AND PARTICIPATION! SIGN-UP TODAY!