



Recommendations of the Electric Vehicle Working Group - 2024

Approved during the November 2024 meeting
of the Electric Vehicle Working Group

Introduction

The Electric Vehicle Working Group (EVWG) is charged with:

- ▶ Providing recommendations regarding the development, adoption, and integration of light-, medium-, and heavy-duty electric vehicles (EVs) into the transportation and energy systems of the United States.
- ▶ Coordinating and consulting with any existing Federal interagency working groups on fleet conversion or other similar matters relating to EVs.
- ▶ Reporting to the Secretaries of Energy and Transportation; the Senate Commerce, Science, and Transportation Committee; the Senate Appropriations Committee; the House Transportation and Infrastructure Committee; and the House Appropriations Committee.

The members of the EVWG formed three subcommittees in December 2023 with the following charges (among others):

- ▶ **Charging Network:** Develop a game plan for achieving broader public education and awareness of EV ownership and usage, and for creating a baseline for the current charging infrastructure.
- ▶ **Medium- and Heavy-Duty Vehicles:** Focus on the unique needs of vehicle classes six through eight, which include delivery vehicles, transit buses, on-highway tractor-trailers, and vocational trucks. The main objective of this subcommittee is to facilitate the transition of these vehicles from internal combustion engines to electric propulsion.
- ▶ **Grid Integration:** Focus on four areas to ensure the “sustainable” integration of EVs into the electrical grid ecosystem: grid readiness; comprehensive planning; transparency and education; and partnerships.

The EVWG group is charged with developing three reports, and interim recommendations to the Secretaries on critical issues that need more immediate attention. The first report was produced in April 2024.

After receiving public input, holding multiple subcommittee meetings among subject matter experts from the Working Group, and deliberating on the most pressing issues in the light-, medium-, and heavy-duty EV market, the EVWG has developed the following initial recommendations. These recommendations are deemed critical and in need of immediate attention. The recommendations fall into three broad categories:

- ▶ **Public Communications and Information Dissemination:**
 - EV Charging Public Education and Awareness Campaign
 - Create an EV Charging Station “Competition to the Top”
 - Medium- and Heavy-Duty EV Truck Total Cost of Ownership (TOC) Education and Awareness Campaign
 - Broad Industry Engagement on Market Segmentation and Classifications for Medium- and Heavy-Duty EV Trucks
- ▶ **Grid Integration:**
 - Support Infrastructure Investments
 - Managed Charging
- ▶ **Research and Development:**
 - Continued Research and Development in Emerging Technologies

The recommendations represent “what” activities the EVWG, government at all levels, and industry should work on in the near future. It does not detail “how” these recommendations should be implemented. That work will be conducted in the future and in consultation with other stakeholders.

Public Communications and Information Dissemination

Recommendation 1: EV Charging Public Education and Awareness Campaign

Recommendation: The EVWG recommends launching a public education and awareness campaign around the ease and awareness of EV charging.

Background: Government and private sectors have worked together in the past to build public awareness for technology developments and safety campaigns. An example of a similar program is the U.S. DOT National Highway Traffic Safety Administration’s [Click it or Ticket](#) campaign.

Audience: General public, car rental customers, and dealership customers.

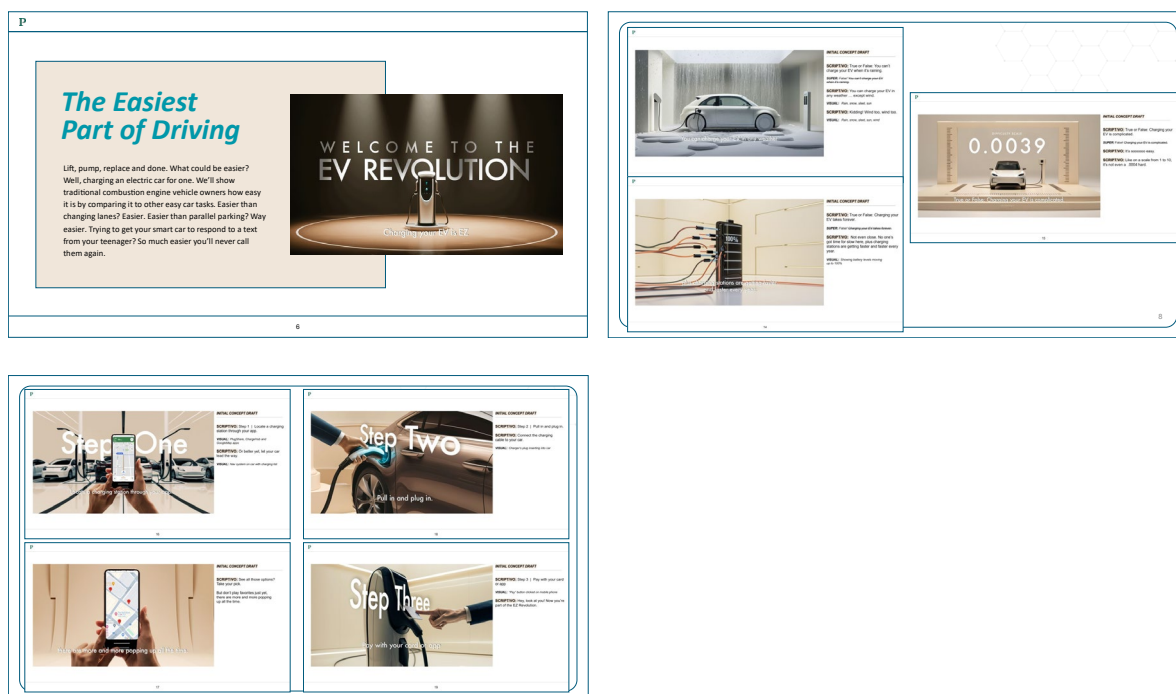


FIGURE 1: SAMPLES OF WHAT COULD BE INCLUDED IN THE CAMPAIGN

Recommendation 2: Create an EV Charging Station Competition to the Top

Recommendation: The EVWG recommends the development of a consumer-facing effort to identify charging points that implement customer-facing attributes that align with the National Electric Vehicle Infrastructure (NEVI) program through a certification entity with the following principles:

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- ▶ Credibility – credible with industry, government and consumers
 - ▶ Expertise – has the technical expertise to assess compliance with all requirements
 - ▶ Scale – can conduct assessments nationwide

Background: The certification entity will develop a program that incentivizes charging stations following the consumer-facing minimum NEVI standards, listed below. This would be a “carrot” approach that would look to reduce the number of poor charging experiences.

Consumer-facing minimum NEVI standards (there may be additional standards to consider):

- ▶ Accessibility
- ▶ Payment methods
- ▶ Pricing
- ▶ Uptime
- ▶ Station configuration
- ▶ EV charging signage

Examples of similar programs include the National Highway Traffic Safety Administration’s [New Car Assessment Program](#) (NCAP) and the U.S. Environmental Protection Agency’s [Energy Star Program](#).

Audience: Implementing agencies and organizations.

Recommendation 3: Medium- and Heavy-Duty EV Total Cost of Ownership (TCO) Education and Awareness Campaign

Recommendation: The EVWG recommends launching a targeted public education and awareness campaign to provide reliable, data-driven information on the Total Cost of Ownership (TCO) of medium-duty and heavy-duty (MDHD) battery electric vehicles (BEVs) and hydrogen-propelled vehicles. This initiative addresses widespread misconceptions that TCO is primarily dominated by capital expenditures (CAPEX) for vehicle purchases, overlooking critical lifecycle cost factors.

It is vital to highlight the complexities of TCO analysis and ensure stakeholders, decision-makers, and industry groups can access accurate, validated, and up-to-date tools. These tools should leverage the latest industry and government resources to enhance understanding and support the adoption of MDHD BEVs.

Background: The TCO of MDHD BEVs encompasses numerous dynamic factors that influence overall cost and feasibility. These include:

- ▶ Design and Battery Technology: Upfront costs are primarily driven by the type and size of the battery, which varies based on vehicle design and range requirements.
- ▶ Insurance Costs: Long-term insurance expenses, which evolve based on vehicle safety and reliability metrics, are a key component of TCO.
- ▶ Operational Costs: Measured on a per-mile or per-kWh basis, these include electricity costs, which depend on charging location (e.g., depot versus on-the-go charging).
- ▶ Maintenance Costs: BEVs benefit from reduced servicing needs compared to internal combustion engine (ICE) vehicles, but battery-specific maintenance must be considered.
- ▶ Depreciation and Residual Value: The long-term depreciation rate and potential residual value at the end of the vehicle’s life significantly affect TCO calculations.

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- ▶ **Weight Trade-offs:** Higher battery weights can reduce freight capacity, impacting revenue and operational efficiency.
 - ▶ **Refueling Time:** The time required for charging impacts driver productivity, duty day limitations, and overall logistics planning.

These cost components evolve rapidly as technology advances and the market matures. A nuanced understanding of TCO is essential for designing effective policies, funding mechanisms, and deployment strategies for MDHD BEVs.

Proposed Activities:

- ▶ **Highlight the Full Spectrum of TCO Components:** Educate stakeholders on the lifecycle cost benefits of MDHD BEVs, including operational savings, available incentives, and long-term economic advantages compared to ICE vehicles.
- ▶ **Leverage and Validate Existing Tools:** Reference and enhance existing TCO analysis tools developed by industry and government to ensure they are robust, user-friendly, and up to date to reflect market dynamics and policy changes.
- ▶ **Collaborate Across Sectors:** Partner with industry leaders, advocacy organizations, academic institutions, and government agencies to deliver consistent, credible, and data-driven messaging.
- ▶ **Tailor Messaging to Diverse Audiences:** Develop audience-specific content to dispel myths and build confidence in MDHD BEV adoption.
- ▶ **Include Case Studies and Testimonials:** Showcase real-world examples of fleets successfully transitioning to MDHD BEVs to inspire confidence and encourage adoption.
- ▶ **Support Stakeholder Decision-Making:** Provide actionable resources to help stakeholders understand and navigate subsidies, incentives, and cost considerations.

Audience: The campaign should target key stakeholders, including:

- ▶ **Fleet Operators and Owners:** To inform purchasing decisions and operational planning.
- ▶ **Implementors and Infrastructure Planners:** To ensure alignment between vehicle deployment and charging infrastructure.
- ▶ **Policy Makers:** To guide legislation, incentives, and funding programs that support MDHD BEV adoption.

By launching an MDHD-focused EV public education and awareness campaign, Congress can empower stakeholders with trustworthy, actionable information that accelerates the adoption of MDHD BEVs. This effort will help dismantle misconceptions, enable data-driven decisions, and support the transition to a cleaner, more efficient transportation sector.

Recommendation 4: Broad Industry Engagement on Market Segmentation and Classifications for EV Medium- and Heavy-Duty Trucks

Recommendation: The EVWG recommends adopting and publishing a standardized classification system for medium-duty and heavy-duty (MDHD) vehicles, including trucks, buses, and other vehicles. This classification should be based on size, use case, and operational capability to ensure consistent understanding and application across the industry.

Background: MDHD vehicles encompass a wide spectrum of gross vehicle weights (GVWs), operational scenarios, and capabilities. However, a prevalent misconception equates MDHD trucks solely with long-haul, large-class vehicles, overlooking the diverse range of vehicle types. These vehicles vary significantly in:

- ▶ **Weights and Sizes:** Vehicles can range from medium-duty delivery trucks to heavy-duty construction vehicles, each with unique needs and capabilities.
- ▶ **Use Cases:** Applications include regional freight delivery, municipal services, school and transit buses, and long-haul trucking.
- ▶ **Operational Considerations:** Factors such as charging needs, route patterns, payload capacity, and regulatory requirements differ across vehicle categories.

This diversity necessitates a clear, standardized classification framework to enhance industry alignment, planning, and implementation efforts.

Proposed Activities:

- ▶ **Develop Standardized Classifications:** Collaborate with stakeholders to define vehicle categories by weight, size, use case, and operational needs.
- ▶ **Enhance Industry Awareness:** Educate stakeholders on the diverse roles and requirements of MDHD vehicles beyond long-haul trucking.
- ▶ **Provide Targeted Educational Tools:** Create resources like guides, case studies, and operational profiles to improve decision-making.
- ▶ **Support Policy Integration:** Advocate for inclusion of standardized classifications in policies, incentives, and funding to align goals across sectors.
- ▶ **Enable Infrastructure Planning:** Use classifications to guide charging and operational infrastructure tailored to vehicle-specific needs.

Audience:

The primary audience for this recommendation includes:

- ▶ **Planners:** To design and implement appropriate charging infrastructure, routes, and operational frameworks.
- ▶ **Industry Participants:** Including manufacturers, fleet operators, and suppliers to ensure consistency in communication, product development, and market analysis.
- ▶ **Implementors:** Such as infrastructure providers, utility companies, and policymakers responsible for enabling the transition to MDHD electrification.

By adopting and publishing a standard classification definition for MDHD vehicles, the EVWG can help bridge gaps in understanding, align stakeholders, and accelerate the electrification transition. This framework will support planners, industry participants, and implementors in designing targeted solutions that reflect the diversity of MDHD vehicle applications and capabilities.

Recommendation 5: Public Education and Outreach on High-Power Charging for Medium- and Heavy-Duty Trucks

Recommendation: The EVWG recommends that government and industry collaborate to address information gaps surrounding high-power charging and the unique needs of medium-duty and heavy-duty (MDHD) electric trucks through comprehensive public education and outreach initiatives.

Background: High-power charging for medium-duty and heavy-duty (MDHD) vehicles presents unique infrastructure, operational, and technological challenges that require targeted education and collaboration. Policymakers, planners, utilities, and industry stakeholders need a clearer understanding of these distinct requirements to effectively support and encourage the transition to MDHD electric vehicles. Encouraging stakeholder dialogue is essential to identify challenges and develop actionable solutions that address immediate needs and long-term goals. Additionally, fostering public engagement is critical to building a broader community understanding of the benefits and opportunities offered by MDHD EVs, ultimately accelerating their adoption and integration into the transportation ecosystem.

Some of these unique MDHD EV requirements and considerations include:

- ▶ Potential positive impacts and benefits for MDHD BEVs across a broad spectrum of use cases.
- ▶ Very high-power charging requirements and the lack of current infrastructure to support the requirements.
- ▶ The impact of high-power demands during potentially peak hours on electricity rates and fees.
- ▶ The need to charge relatively quickly to support operations and driver workday restrictions.
- ▶ Wide variations of operational considerations based on the class, use case, and market segmentation of the vehicle.
- ▶ Challenges associated with range limitations, lack of available high-power charging, and operational constraints for long-haul trucking.
- ▶ Continually changing technologies complicate investment decisions.
- ▶ Lack of standardized regulations, requirements, and expectations.

Proposed Activities:

- ▶ **Develop Tailored Communication Tools:** Utilize diverse channels, including social media, websites, blogs, and webinars hosted by educational groups, to deliver targeted messaging to various audiences.
- ▶ **Organize In-Person Events:** Host seminars and discussions at major EV events to facilitate dialogue and collaboration on challenges and solutions.
- ▶ **Conduct Workshops and Community Engagement Events:** Educate stakeholders and the broader public on the benefits and challenges associated with MDHD EVs, emphasizing high-power charging infrastructure.

Audience: The outreach should be directed toward:

- ▶ **Policymakers and Planners:** To guide effective regulation and infrastructure planning.
- ▶ **Utilities and Key Industry Groups:** To align efforts and ensure grid readiness for high-power charging.
- ▶ **Implementors:** To streamline deployment and operational strategies.

By implementing a robust public education and outreach program, the EVWG can address critical knowledge gaps, promote collaboration, and accelerate the adoption of MDHD EVs and supporting high-power charging infrastructure. This initiative will ensure stakeholders are equipped to support the unique needs of MDHD trucks, fostering a successful transition to electrified transportation.

Grid Integration

Recommendation 6: Support Infrastructure Investments

Recommendation: The EVWG recommends that Federal, State (including applicable regulatory bodies and policymakers), utilities, and other key decision-makers urgently collaborate to support infrastructure investment by developing improved data and forecasting practices, mechanisms that can reduce or distribute risks of investments made in anticipation of demand growth, and/or other alternative approaches that enable the rapid, efficient building of capacity and infrastructure that will be available to rapidly meet expected demand.

Call to Action: To support committed and future investments and benefits, infrastructure investments should be made to enable the accelerated electrification of vehicles and energization of EV chargers by reducing investment risk. This can be achieved by:

- ▶ Developing new and improved data, modeling, and frameworks that can better predict infrastructure and investment needs;
- ▶ Building consensus, as needed, as well as confidence among key stakeholders (e.g., utilities, auto Original Equipment Manufacturers (OEM), investors, regulators, policymakers) on the risk profile of predicted EV market development needs;
- ▶ Identifying innovative mechanisms that government (Federal, State, local) and industry can deploy to manage risks of grid investments that are made in anticipation of demand growth; and
- ▶ Identifying existing or new authority, or funding needed to execute these strategies (e.g., Federal backstop/guarantee/loans/grants) for accelerated utility grid upgrades.

Background: To most efficiently and effectively prepare the grid to safely, affordably, and reliably satisfy new demand from the electrification of transportation in a timely manner, more investments in system upgrades are necessary.

Historically, new infrastructure was built only to accommodate known and identified demand that was typically locationally specific and relied on data and information coming from direct customer load letters or interconnection requests, and/or standard system planning to accommodate historic load growth patterns. Utilities are hesitant to invest in the grid without the certainty of investment pre-approval by their regulators, including State public utility commissions, city councils, or board members (depending on the structure of the utility). All parties can be cautious about proactively building for new EV load based upon concerns that they may not know the exact necessary location and the rate at which the new load will materialize (i.e., EV adoption) because investments could become stranded.

However, EV charging infrastructure developers report that the lack of available grid capacity is slowing transportation electrification in some regions, and investment is needed now to prevent this from becoming a deeper, more widespread impediment. Concerns are particularly apparent for medium- and heavy-duty vehicles, which require large scale power supply. Many in the EV industry note that a prudent, forward-thinking approach to investments could improve the overall cost effectiveness and speed of infrastructure build-out in the long run—for example, by adding capacity or upgrading service lines all at once, in anticipation of future needs, rather than reactively making costly improvements repeatedly over time.

Recommendation 7: Managed Charging

Recommendation: The EVWG recommends the formation of a consortium of key stakeholders, including utilities, vehicle OEMs, applicable industry standards organizations, EV Service/Equipment Providers (as defined below), and other relevant stakeholders, led by the U.S. Department of Energy, to develop standard data requirements and communication protocols for managed charging among the key parties that is scalable and extensible. During this effort, evaluate system limitations and funding sources for gaps. Partner with vehicle OEMs, applicable standards organizations, EV Service/Equipment Providers (EVSP and EVSE), and utilities to commit to rollout the new communications protocol, including the needed consumer interface (e.g., by vehicle OEM, EVSE, or EVSPs) and time-based or other grid-flexibility demand indicators of grid needs (e.g., by utilities).

Background: Managed charging (e.g., shifting vehicle charging to times that avoid grid constraints or reduce the curtailment of variable clean energy resources) can help mitigate certain grid investments and allow more efficient grid operation, thereby reducing electricity cost for EV users and general ratepayers. However, to be effective, managed charging must occur at large scale and have very low “friction” and implementation costs that encourage usage and provide sufficient value. Successful lower volume demonstrations have occurred; now there is a need to align and scale. Scaling requires standard communications among utilities, vehicle OEMs, EVSE, and EVSP, as applicable, to receive and use data to adjust consumer charging.

Managed charging has been projected to reduce the needed investment in grid infrastructure, including in a substantial manner under various studies. However, today’s fractured approach limits achieving savings and the associated benefits for EV drivers and utility customers. Challenges that must be addressed include:

- ▶ Lack of signals indicating grid conditions and the need for flexibility from EVs;
- ▶ Uncertainty of dependable response from EV or EVSE / EVSP to shift load;
- ▶ Fractured and tailored solutions are currently being implemented; and
- ▶ Large number of friction points and poor customer experience limit participation.

In the absence of standardized, automated, customer-centered managed charging approaches, the potential for the substantial scale necessary to capitalize on the advantages of avoided infrastructure investments and corresponding cost savings will remain unrealized.

Research and Development

Recommendation 8: Continued Research and Development in Emerging Technologies

Recommendation: The EVWG recommends that government and industry maintain and expand collaborative efforts in researching and developing emerging technologies. This includes advancements in battery systems, hydrogen fuel cells, and other interim or long-term solutions. A diverse approach to technology adoption is essential to address the varying needs of medium-duty and heavy-duty (MDHD) vehicles and to accelerate decarbonization initiatives.

Background: While battery electric vehicles (BEVs) play a central role in decarbonization efforts, they may only partially meet the requirements of all MDHD vehicle use cases, particularly those involving long-haul operations, extreme payloads, or off-grid applications. Investing in a portfolio of technologies that can complement BEVs and address these unique challenges is necessary to ensure comprehensive and effective decarbonization.

Key Areas of Focus:

- ▶ **Advanced Battery Systems:** Research higher-density, faster-charging, and more durable battery technologies to extend the range and reduce charging time for MDHD vehicles.
- ▶ **Hydrogen-propelled Vehicles:** Explore hydrogen-based solutions for long-haul and high-capacity applications where battery solutions may face limitations.
- ▶ **Hybrid and Interim Technologies:** Investigate hybrid approaches and transitional technologies to support decarbonization in scenarios where full electrification is not yet feasible.
- ▶ **Infrastructure Integration:** Develop infrastructure solutions that can accommodate diverse technologies, ensuring compatibility and efficiency across platforms.
- ▶ **Lifecycle Analysis:** Conduct comprehensive assessments of environmental and economic impacts for all technologies to guide development and adoption strategies.

Proposed Collaboration:

- ▶ **Government:** Provide funding, regulatory support, and incentives to drive innovation and pilot projects.
- ▶ **Industry:** Lead in prototyping, testing, and scaling emerging technologies while sharing insights and data to refine approaches.
- ▶ **Joint Efforts:** Foster public-private partnerships to pool resources, share knowledge, and expedite breakthroughs.

Decarbonizing the MDHD vehicle sector requires a forward-looking strategy that embraces a diverse array of technologies. By continuing collaborative research and development efforts, the government and industry can address the limitations of BEVs and ensure a holistic approach to achieving climate and sustainability goals.