U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

2025 Incremental Purchase Cost Methodology and Results for Clean Vehicles

Vehicle Technologies Office

January 2025

Executive Summary

DOE is updating its 2022 analysis of incremental purchase costs of electrified vehicles to reflect significant reductions to electric vehicle battery costs as well as decreases in other technology costs over the past two years. This report demonstrates reduced battery costs compared to DOE's prior 2022 analysis which translate directly to reduced vehicle costs for all classes of battery electric, plug-in hybrid, and fuel cell vehicles. In this 2025 report, results reflect an updated analysis of component and vehicle manufacturing costs including refinements to the approach previously employed for determining an incremental purchase cost for plug-in and fuel cell vehicles. DOE also expands medium and heavy-duty vehicle classes previously analyzed and updates results based on current costs of technology.

Reducing the cost of new vehicle technology for consumers is a central focus of DOE R&D efforts and has led to substantial reductions in the cost of plug-in and fuel cell vehicles over time.

As in the 2022 analysis, vehicle modeling was conducted utilizing the DOE Autonomie model, managed by Argonne National Laboratory, to model a "representative" vehicle based on target performance characteristics for both conventional and electric powertrains. DOE calculated the incremental cost for each clean powertrain for different vehicle types/classes across light, medium and heavy-duty vehicles by focusing on powertrain-relevant elements for battery- and plug-in hybrid, and fuel cell electric vehicles (BEVs, PHEVs, or FCEVs) and selecting battery and fuel cell size/fuel storage to match vehicle range requirements. This numerical simulation-driven modeled approach allows DOE to estimate a true "apples-to-apples" incremental purchase cost for each type of powertrain, independent of any other market factors, incentives, discounts, tax credits, or non-powertrain related product differences.

For 2025, DOE incorporated updated component cost data for all vehicle classes. Battery costs for light-duty vehicles, sport utility vehicles, pick-up trucks and Class 3 vans were captured as $128-133/kWh, reduced from $150/kWh used in the 2022 analysis, highlighting improvements for this important component and cost driver. Battery cost is a key input given its significant impact on the overall vehicle cost for BEVs and PHEVs. The reductions in battery cost shown below translate directly to reduced vehicle cost.

ES-1: Battery Costs for LDV

Vehicle Type/Class	2025 Report BEV High Voltage Battery Cost 2024$	2022 Report BEV High Voltage Battery Cost 2024$	Difference 2025 to 2022 Report 2024$
Compact Car	$9,185	$10,995	($1,810)
Midsize Car	$9,929	$11,343	($1,414)
Midsize SUV	$11,032	$15,166	($4,134)
Pickup Truck	$15,368	$18,364	($2,996)

For heavier duty Class 4-8 vehicles, battery costs correspond to current understanding of technology maturity and production volume across the different classes and vocations and range from $162-

$206/kWh. These costs represent a point in time reflective of current market conditions and include costs associated with low production volumes of first-generation products. Industry announcements and sales volume trends suggest that these costs will decrease significantly in the next few years.

DOE anticipates that incremental costs for clean vehicles of all classes will continue to decline as costs of EV batteries, powertrain components, vehicle materials, and hydrogen fuel cells continue to decline. DOE intends to revisit this analysis periodically to capture decreasing component costs, and if needed, refine its approach set forth in this document.

Table ES-2: 2025 Incremental Purchase Costs between a Clean and Internal Combustion Engine Vehicle

Vehicle Type / Class	BEV – ICE (2024$)	PHEV – ICE (2024$)	FCEV – ICE (2024$)
Compact Car	$7,900	$7,100	$17,100
Midsize Car	$9,600	$7,200	$21,700
Midsize SUV	$11,000	$8,000	$26,400
Pickup Truck	$18,800	$9,300	$36,300
Class 3	$15,800	$29,500	$38,300
Class 4	$30,000	$44,000	$36,000
Class 5	$40,000	$32,000	$28,000
Class 6	$40,000	$54,000	$47,000
Class 7 Bus	$40,000	$50,000	$43,000
Class 7 Tractor	$81,000	$95,000	$83,000
Class 8 Transit	$107,000	$102,000	$52,000
Class 8 Regional	$112,000	$131,000	$98,000
Class 8 Longhaul	$243,000	$237,000	$127,000

To better isolate the impacts of technology cost reductions without including the impact of inflation, the incremental costs from the previously published 2022 analysis are shown in Table ES-3 below in present dollars (2024$) for comparison to the current analysis.

Table ES-3: Comparison of 2025 Incremental Purchase Costs to 2022 Incremental Purchase Costs (both in 2024$)

<table>
<tr><th>Vehicle Type / Class</th><th>BEV – ICE 2025 Report (2024$)</th><th>BEV – ICE 2022 Report (2024$)</th><th>PHEV – ICE 2025 Report (2024$)</th><th>PHEV – ICE 2022 Report (2024$)</th><th>FCEV – ICE 2025 Report (2024$)</th><th>FCEV – ICE 2022 Report (2024$)</th></tr>
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Introduction

The Department of Energy Vehicle Technologies Office funds applied research on innovative vehicle technologies that reduce costs for consumers and position the U.S. auto industry for leadership in the global market. While electric vehicles already have a lower cost for fuel and maintenance than vehicles with internal combustion engines, this report seeks to document the difference in up front purchase cost between conventional and clean vehicles to further inform consumers and others on these developments.

As additional models of plug-in electric vehicles have become available and annual sales grow, and as additional data on these vehicles has become available to DOE and National Lab researchers, there has been a corresponding improvement in understanding of clean vehicle cost drivers across more vehicle types. Therefore, DOE is updating its prior analysis on incremental purchase costs of clean vehicles.[1] In this 2025 report, DOE is updating its prior analysis and reporting its current approach for determining an incremental purchase cost[2] for plug-in hybrid electric vehicles (PHEVs), battery electric vehicles (BEVs), and fuel cell electric vehicle (FCEVs) using best current data sources for component and vehicle manufacturing costs. The results herein are provided for several classes of vehicles DOE has previously analyzed, including higher resolution analysis of several categories/vocations of medium- and heavy-duty vehicles (MHDVs) as well as updated component costs across vehicle classes.

Background

DOE's support of clean vehicle and battery research has helped to drive the downward trajectory of clean vehicle and battery costs.[3] Prior DOE analyses estimate that the cost of an electric vehicle lithium-ion battery pack dropped 87% between 2008 and 2021 (using 2021 constant dollars).[4] Future research seeks to drive the cost of EV batteries to under $75/kWh at the pack level and $60/kWh at the cell level for light-duty vehicles (LDVs); and $75/kWh at the cell level by 2030 for MHDVs.[5]

Indeed, the gains identified in research are already translating into cost savings being realized in areas associated with batteries, specific vehicle designs for advanced electric and fuel cell powertrains, and the strong, lightweight materials being employed in vehicle bodies. Savings in these areas are expected to continue to increase as higher production volumes are achieved across all vehicle classes. As technology costs decline, there will be a need to periodically update this report.

Methodology

The incremental purchase cost of a clean vehicle is the excess of the purchase cost of such a vehicle over the purchase cost of a comparable ICE vehicle. Variation across vehicle makes and models makes it difficult to determine the incremental cost of vehicle electrification technologies by comparing two vehicles currently for sale. Additionally, market dynamics are frequently changing

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[1] *See* U.S. Department of Energy, "2022 Incremental Purchase Cost Methodology and Results for Clean Vehicles," December 2022, available at https://www.energy.gov/sites/default/files/2022-12/2022.12.23%202022%20Incremental%20Purchase%20Cost%20Methodology%20and%20Results%2 0for%20Clean%20Vehicles.pdf. DOE amended its 2022 analysis in December 2023 to incorporate minor modifications. The minor modifications did not change the results of its 2022 analysis. U.S. Department of Energy, "Incremental Purchase Cost Methodology and Results for Clean Vehicles," originally published December 2022 and amended December 2023, available at https://www.energy.gov/sites/default/files/2023-12/2023.12.18%20Incremental%20Purchase%20Cost%20Methodology%20and%20Results%20for%20Cl ean%20Vehicles%20pub%2012-2022%20amd%2012-2023%20Final_2.pdf.

[2] These incremental costs are estimates for representative vehicle classes and do not necessarily reflect the incremental costs a consumer may experience for a particular model.

[3] Argonne National Laboratory. ANL - ESD-2206 Report 2022 DOE VTO HFTO Transportation Decarbonization Analysis https://anl.app.box.com/s/an4nx0v2xpudxtpsnkhd5peimzu4j1hk/folder/242640145714

[4] 2018–2021 – U.S. DOE, Vehicle Technologies Office, using Argonne National Laboratory's BatPaC: Battery Manufacturing Cost Estimation Tool; 2017 – Steven Boyd, DOE, Vehicle Technologies Office, 2017 Annual Merit Review, Batteries and Electrification R&D Overview, June 18, 2018, PowerPoint presentation, p. 7; 2016 – David Howell, DOE, Vehicle Technologies Office, 2017 Annual Merit Review, Electrochemical Energy Storage R&D Overview, June 20, 2017, PowerPoint presentation, p. 6; 2008–2015 – National Academies of Sciences, Engineering, and Medicine 2017. Review of the Research Program of the U.S. DRIVE Partnership: Fifth Report. Washington, DC: The National Academies Press, p. 173.

[5] DOE FY24 Budget Volume 4, Energy Efficiency and Renewable Energy Proposed Appropriation Language, https://www.energy.gov/sites/default/files/2023-06/doe-fy-2024-budget-vol-4-v2.pdf, p. 24 (LDVs); https://www.energy.gov/sites/default/files/2023-12/21CTP-ETT-Roadmap_Final_Sep2023_compliant_corrected_08Dec23.pdf (MHDVs).

based on manufacturer and dealer incentives, among other factors, and are out of scope for this analysis. However, it is relatively straightforward to analytically estimate the incremental cost of deploying an electric powertrain (PHEV, BEV, or FCEV) in place of the powertrain of an internal combustion engine (ICE) vehicle. Industry original equipment manufacturers (OEMs) commonly use this analytical approach to determine the incremental cost for a new BEV, PHEV, or FCEV.

The DOE Autonomie model, managed by Argonne National Laboratory, allows a user to customize powertrain components and analyze the key powertrain technologies that differ between conventional and electric powertrains. Autonomie is updated regularly and has undergone extensive vetting and input from industry, including a recent review by U.S. DRIVE[6] and 21st Century Truck Partnership[7], two voluntary government-industry partnerships focused on advanced automotive and related energy infrastructure technology research and development.

Vehicle Sizing Requirements and Algorithms Overview

Vehicle and component sizing for both LDVs and MHDVs is determined by performance and payload requirements, efficiency standards, and by tailoring configurations to specific operational demands for the class and/or vocation of vehicle.

LDVs are sized to achieve performance targets across metrics like gradeability, payload, towing, and acceleration established by industry trends and consumer demands. Key requirements include handling a 6% grade at 65 mph and achieving specific 0-60 mph times—9 seconds for compact cars and 7 seconds for pickup trucks. Pickups also support substantial payloads (650 kg) and towing capacities (up to 3 tons), allowing flexibility to meet diverse consumer needs across various driving scenarios.

[6] Vehicle Technologies Office. U.S. DRIVE. https://www.energy.gov/eere/vehicles/us-drive

[7] Vehicle Technologies Office. 21st Century Truck Partnership. https://www.energy.gov/eere/vehicles/21st-century-truck-partnership

Table 1: LDV Performance Characteristics Summary

Powertrain	Engine / Fuel cell	Motor	Battery
Conventional	Acceleration and Grade	N/A	N/A
PHEV	70% of the acceleration peak power requirement	Acceleration, Grade and ensuring EV-only operation for US06 drive cycle	Energy: based on driving range in representative duty cycle. Power: Sufficient power to support motor & aux. loads
BEV	N/A	Acceleration and Grade	
FCEV	70% of the acceleration peak power requirement & Storage sized to meet the required range	Acceleration and Grade	Power: Sufficient power to support the motor through regenerative braking & aux. loads

For MHDVs, the focus is on retaining full payload capacity and performance without compromise. Testing includes maintaining performance at maximum Gross Vehicle Weight Rating (GVWR), enduring a 6% grade climb for 11 miles, and achieving requirements in both U.S. EPA and real-world driving cycles. This approach guarantees that alternative powertrains match or exceed the capabilities of traditional ICE models.

Table 2: MHDV Performance Characteristics Summary

<table>
<tr><th>Powertrain</th><th>Engine / Fuel cell</th><th>Motor</th><th>Battery</th></tr>
<tr><td>Conventional</td><td>Acceleration, Grade and Cruise</td><td></td><td></td></tr>
<tr><td>PHEV</td><td>Grade and Cruise</td><td rowspan="2">Acceleration
Grade and Cruise</td><td rowspan="2">Energy: based on driving range in representative duty cycle.
Power: Sufficient power to support motor & aux loads</td></tr>
<tr><td>BEV</td><td>NA</td></tr>
<tr><td>FCEV</td><td>Cruise</td><td>Acceleration
Grade & Cruise</td><td>Sufficient to augment fuel cell on a 11 mile, 6% grade climb.
Enables regenerative braking too</td></tr>
</table>

Specific Sizing Algorithms by Powertrain Type

Algorithms for conventional ICE vehicles optimize engine and transmission configurations to meet acceleration and gradeability needs while balancing fuel efficiency and emissions. The process starts with a baseline setup of engine power and vehicle weight, followed by adjustments to meet specific conditions like high-speed cruising, stop-and-go, and uphill driving. This method ensures that fuel consumption is optimized for each vehicle class while delivering smooth drivability for the given requirements.

BEV sizing prioritizes battery capacity and motor power to meet range and power demands. The algorithm calculates the battery energy needed for the vehicle's All-Electric Range (AER) under different conditions, such as urban (UDDS) and highway (HWFET) cycles. Motors are sized to manage peak power for acceleration and load-bearing scenarios, and the vehicle's weight is adjusted iteratively, balancing range, performance, and regenerative braking capabilities. This ensures BEVs achieve efficient operation with optimal power and range configurations.

PHEV algorithms balance the ICE and electric motor sizes needed to support both electric-only and hybrid driving modes. The ICE typically covers around 70% of peak power for performance, and the battery is sized to meet an electric range target (*e.g.*, 50 miles), while allowing vehicles to operate solely on electric power for the US06 drive cycle. Adjustments accommodate varying weights of components, ensuring fuel efficiency and smooth transition between electric and hybrid power modes.

FCEVs use hydrogen fuel cells as the primary energy source, supplemented by a battery to support peak demands, such as during acceleration and regenerative braking. The fuel cell is sized to provide around 70% of peak power, and hydrogen storage is configured to meet desired range standards across driving cycles. The electric motor and battery support additional power needs, enabling FCEVs to deliver an efficient performance with both range and power capabilities optimized for smooth operation.

Each algorithm is designed to align vehicle components with performance, efficiency, and range requirements, ensuring that each vehicle type meets modern operational standards requirements across the respective powertrain type.

Using the Autonomie model, DOE estimated the current incremental cost for each powertrain for the different representative vehicle classes. Component cost data was drawn from several sources including vehicle tear-down data, industry input, and current vehicle regulations. Vehicle classes are defined below in Table 3. In this 2025 report, DOE has enhanced its examination of incremental purchase costs with additional granularity across vehicle classes, particularly the medium and heavy-duty classes/vocations for which vehicle designs and missions vary significantly within a class. For these vehicle classes, the vehicles modeled are representative of the broader vehicles classes that use a range of battery and fuel cell sizes, and which are defined at 40 CFR § 600.315-08.

Table 3: Mapping of Modeled Vehicle to Broader Represented Classes of Vehicles[8]

Representative Vehicle Modeled (Vehicle Type/Class)	Examples of Representative Vehicles	Gross Vehicle Weight Rating of Representative Vehicle Classes
Compact Car	Mini compact, Subcompact & Compact Cars, Class 1 (vehicle example Honda Civic)	<6,000 lbs.
Midsize Car	Midsize and Large Car, All Station Wagons, Class 1 (vehicle example Hyundai Sonata)	<6,000 lbs.
Midsize SUV	Standard SUV, Small SUVs, Minivans, Class 1 (vehicle example Toyota RAV4)	<6,000 lbs.
Pickup Truck	Pickup Trucks, Class 2 (vehicle example Ford F-150)	<10,000 lbs.
Class 3	Flatbed trucks, box trucks, extended bed cargo vans	10,001 - 14,000 lbs.
Class 4	Box trucks, large walk-in, delivery	14,001 – 16,000 lbs.
Class 5	Bucket, some dump, cherry picker, and crane service trucks, larger city delivery trucks	16,001 – 19,500 lbs.
Class 6	Single axle, beverage, moving, general freight, and rack trucks for various commercial purposes, large school bus (engine in front of windshield) specifically designed to transport students	19,501 – 26,000 lbs.
Class 7 Bus	Large school bus (engine behind windshield) specifically designed to transport students	26,001 – 33,000 lbs.
Class 7 Tractor	Day cab, larger delivery, street sweeper, furniture transport	26,001 – 33,000 lbs.
Class 8 Transit	Semi-truck, large equipment hauling, larger urban/suburban transportation service buses	>33,000 lbs.
Class 8 Regional	Cement, dump, refuse, and some combination trucks	>33,000 lbs.
Class 8 Longhaul	Combination, sleeper	>33,000 lbs.

[8] 40 CFR § 600.315-08

Modeled costs also include a Retail Price Equivalent (RPE) factor to account for the additional indirect costs and profits that are included in vehicle MSRPs offered to consumers. This analysis assumes a RPE of 1.5 for LDVs and 1.2 for MHDVs as a multiplying factor to costs to approximate retail prices. All RPE factors by Vehicle Type/Class can be found in Table 4.

Table 4: Retail Price Equivalent by Vehicle Type / Class

Vehicle Type/Class	Retail Price Equivalent
Compact Car	1.5
Midsize Car	1.5
Midsize SUV	1.5
Pickup Truck	1.5
Class 3	1.2
Class 4	1.2
Class 5	1.2
Class 6	1.2
Class 7 Bus	1.2
Class 7 Tractor	1.2
Class 8 Transit	1.2
Class 8 Regional	1.2
Class 8 Longhaul	1.2

Results

For BEVs and PHEVs, battery costs comprise the majority of the incremental manufacturing cost difference and thus are the primary determinant in modeling incremental purchase cost for these vehicles. Additional relevant manufacturing costs include electric powertrain components and may also include materials. For FCEVs, hydrogen storage and fuel cell costs are the chief determinants of incremental cost, and additional powertrain components are also considered relevant to estimating projected incremental cost for FCEVs.

The values in Table 5 show the current purchase cost of representative vehicles across vehicle classes and powertrains, where only the powertrain-relevant elements are exchanged for BEVs, PHEVs, or FCEVs. In this analysis, battery size, as well as fuel cell size and hydrogen storage, were selected to match required vehicle range as noted in Tables A-1 and A-2 provided in Appendix I. The selected vehicle range is based on current understanding of driving needs given still-developing plug-in vehicle charging infrastructure.

Table 5: Modeled Representative Vehicle Purchase Cost, 2025 (2024$)

Vehicle Type/Class	Conv.	BEV	PHEV	FCEV
Compact Car	$25,742	$33,690	$32,852	$42,804
Midsize Car	$26,774	$36,394	$34,014	$48,493
Midsize SUV	$30,347	$41,329	$38,354	$56,732
Pickup Truck	$32,424	$51,244	$41,710	$68,687
Class 3	$48,553	$64,402	$78,027	$86,833
Class 4	$65,573	$96,061	$109,225	$101,333
Class 5	$81,850	$121,365	$113,390	$109,766
Class 6	$90,418	$130,108	$144,352	$137,859
Class 7 Bus	$104,588	$144,584	$154,177	$148,040
Class 7 Tractor	$126,196	$207,267	$221,544	$209,012
Class 8 Transit	$256,819	$363,993	$359,299	$308,820
Class 8 Regional	$168,642	$280,852	$299,951	$266,451
Class 8 Longhaul	$184,928	$427,745	$421,588	$312,078

Battery cost is a key input given its significant impact on the overall incremental cost calculations for BEVs and PHEVs. For 2025, the input reflects battery costs of $128-133/kWh[9] for light duty vehicles (LDVs), including sport utility vehicles (SUVs), pick-up trucks and Class 3 vans. This is reduced from DOE's prior analysis, which estimated battery costs at $150/kWh. With this updated cost reduction, LDV high voltage battery costs dropped across all vehicle classes by thousands of dollars versus previously reported values. Comparison of these BEV costs by LDV class are below.

[9] Knehr, Kevin, Kubal, Joseph, Ahmed, Shabbir. Cost Analysis and Projections for U.S.-Manufactured Automotive Lithium-ion Batteries. Argonne National Laboratory. January 1, 2024. https://www.osti.gov/biblio/2280913

Table 6: Battery Costs for LDV

Vehicle Type/Class	2025 Report BEV High Voltage Battery Cost 2024$	2022 Report BEV High Voltage Battery Cost 2024$	Difference 2025 to 2022 Report 2024$
Compact Car	$9,185	$10,995	($1,810)
Midsize Car	$9,929	$11,343	($1,414)
Midsize SUV	$11,032	$15,166	($4,134)
Pickup Truck	$15,368	$18,364	($2,996)

Battery costs for Class 4-8 vehicles are shown in Table 7 and correspond to current understanding of technology maturity and production volume across the classes and vocations. Because many of these vehicle classes are new for this 2025 report, comparison with DOE's prior analysis is limited.

Table 7: Battery Costs for MHDV

Vehicle Type/Class	BEV	PHEV
Class 4	170	167
Class 5	206	185
Class 6	184	194
Class 7 Bus	178	171
Class 7 Tractor	162	162
Class 8 Transit	186	186
Class 8 Regional	169	169
Class 8 Longhaul	169	169

The estimated battery costs incorporate DOE's understanding of battery production volumes for the different vehicle classes and capture the various prices that OEMs across the market experience. The costs discussed in this report represent a point in time reflective of current market conditions. These values also include costs associated with low production volumes of first-generation products, and they capture additional costs of smaller components and factor in the higher cost of low-volume FCEV production.

In general, battery costs have decreased dramatically since 2008[10] and the costs noted above reflect an average price that DOE estimates OEMs can currently achieve for batteries given the state of technology and the cost of battery inputs. These prices may be higher or lower for any one OEM based on its specific supplier relationships and production volumes. DOE expects that as more new battery production comes online both globally and in the United States, these prices will continue to decrease. DOE's tracking of technology costs indicates that battery costs have decreased notably since its 2022 and 2023 reports.[11] At the vehicle level, this decrease in battery cost is offset in some cases by increased costs to producers over the last four years. Additional cost reductions are expected from advances in EV battery manufacturing and materials. Cost reductions in hydrogen fuel cells and storage are expected to occur more slowly until production volumes grow.

Based upon these assumptions and technology cost reductions, the resulting incremental costs are shown in Table 8 as compared to previously published incremental costs. For light duty vehicles, which have a greater degree of certainty given their higher production volumes, incremental costs are presented rounded to the nearest $100. For heavy duty vehicles, which have technology cost estimates based on a smaller sample size, incremental costs are presented rounded to the nearest $1000.

[10] Vehicle Technologies Office. FOTW #1354, August 5, 2024: Electric Vehicle Battery Pack Costs for a Light-Duty Vehicle in 2023 Are 90% Lower than in 2008, according to DOE Estimates. https://www.energy.gov/eere/vehicles/articles/fotw-1354-august-5-2024-electric-vehicle-battery-pack-costs-light-duty

[11] *See supra note* 1.

Table 8: Comparison of 2025 Incremental Purchase Costs to 2022 Incremental Purchase Costs (both in 2024$)[12]

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<tr><th>Vehicle Type / Class</th><th>BEV – ICE 2025 Report (2024$)</th><th>BEV – ICE 2022 Report (2024$)</th><th>PHEV – ICE 2025 Report (2024$)</th><th>PHEV – ICE 2022 Report (2024$)</th><th>FCEV – ICE 2025 Report (2024$)</th><th>FCEV – ICE 2022 Report (2024$)</th></tr>
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Summary

The decreases in costs found for many of the vehicle classes presented in this 2025 report represent decreasing component costs across technologies and vehicle classes since DOE's initial 2022 and 2023 reports, especially the high-voltage battery for which LDVs saw thousands of dollars of decreased costs.

DOE anticipates that incremental costs for clean vehicles of all classes will continue to decline as costs of EV batteries, powertrain components, vehicle materials, and hydrogen fuel cells continue to decrease. DOE's expectation is based upon the Department's understanding of advances in battery production over the years, industry statements, trade press estimates, and DOE's own predictive modeling of technology trends in consultation with other Federal agencies with equities in the clean transportation space. Pending future market trends and technology advances, DOE intends to revisit

[12] This table is replicated in the Executive Summary as ES-3.

and refine its approach set forth in this document, and if needed, update the calculations of cost comparability.

Appendix – Powertrain Sizing

Table A-1: Battery Size (kWh) and Associated Range (Miles) Assumptions

Vehicle Type/Class	BEV	PHEV
Compact Car	72 / 300	20 / 50
Midsize Car	77 / 300	21 / 50
Midsize SUV	98[13] / 300	25 / 50
Pickup Truck	120 / 300	31 / 50
Class 3 Van	150 / 150	119 / 120
Class 4	180/ 150	141/ 120
Class 5	155[12]/ 150	122 / 120
Class 6	212[12] / 150	172 / 120
Class 7 Bus	198 / 150	164 / 120
Class 7 Tractor	487 / 250	352 / 200
Class 8 Transit	492 / 200	367 / 160
Class 8 Regional	720 / 250	587 / 200
Class 8 Longhaul	1359 / 500	1117 / 400

[12]Battery sizes were adjusted to 86, 210, and 214 kWh respectively in calculations to better match market availability and conditions

Table A-2: Hydrogen Fuel Cell Size and Associated Range Assumptions

Vehicle Type/Class	Fuel Cell Size (kW) / H_2 storage (kg) / Range (Miles)
Compact Car	77 / 4.2 / 300
Midsize Car	98 / 4.8 / 300
Midsize SUV	114 / 6.0 / 300
Pickup Truck	159 / 7.5 / 300
Class 3 Van	78 / 6.7 / 150
Class 4	71 / 8.0 / 150
Class 5 Utility	57 / 6.4 / 150
Class 6 Box	98 / 8.9 / 150
Class 7 Bus	74 / 8.0 / 150
Class 7 Tractor	160 / 27.0 / 250
Class 8 Transit	99 / 8.0 / 200
Class 8 Regional	194 / 32.8 / 250
Class 8 Longhaul	183 / 59.8 / 500