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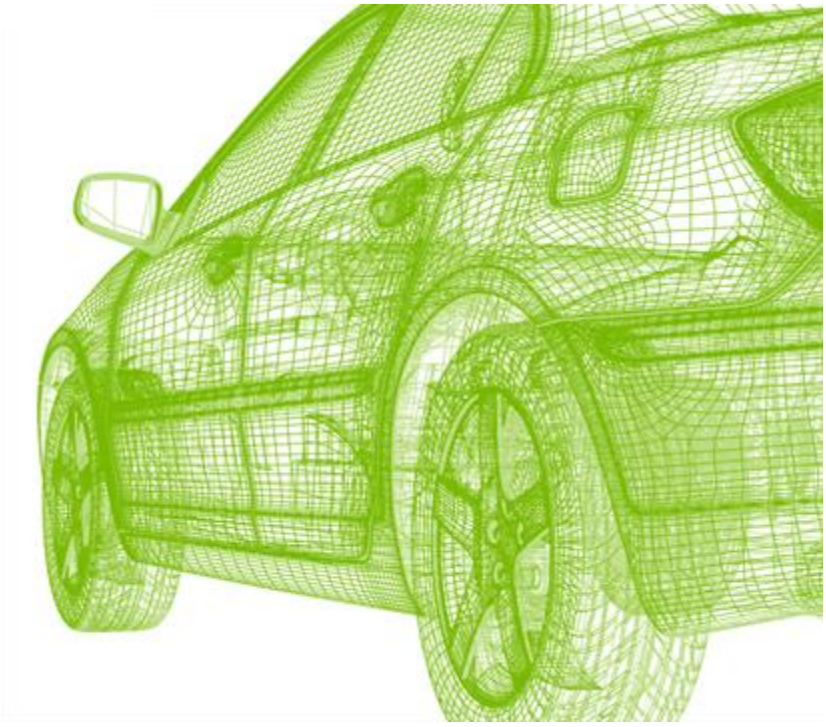

Energy Systems Division

ASSESSMENT OF VEHICLE SIZING, ENERGY CONSUMPTION, AND COST THROUGH LARGE-SCALE SIMULATION OF ADVANCED VEHICLE TECHNOLOGIES

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Assessment of Vehicle Sizing, Energy Consumption, and Cost through Large-Scale Simulation of Advanced Vehicle Technologies

By

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Energy Systems Division, Argonne National Laboratory

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NOTATION

ACRONYMS AND ABBREVIATIONS

AER	all-electric range
Argonne	Argonne National Laboratory
APRF	Advanced Powertrain Research Facility
AU	Automatic Transmission
BEV	battery-powered electric vehicle
BEV100	BEV with 100 miles of all-electric range on UDDS (unadjusted)
BEV200	BEV with 200 miles of all-electric range on UDDS (unadjusted)
BEV300	BEV with 300 miles of all-electric range on UDDS (unadjusted)
CAFE	Corporate Average Fuel Economy
CD	charge depleting
CI	compression ignition
CNG	compressed natural gas
CO_2	carbon dioxide
CS	charge sustaining
CSI	Civil Society Institute
DCT	dual-clutch transmission
DM	Discrete Manual Transmission
DOE	U.S. Department of Energy
E85	blend of 85% ethanol and 15% gasoline by weight
EDV	electric drive vehicle
EIA	Energy Information Administration
EOL	end-of-life
EPA	U.S. Environmental Protection Agency
E-REV	extended-range EV
GPRA	Government Performance and Results Act
GVW	gross vehicle weight
HEV	hybrid electric vehicle
HWFET	Highway Federal Emissions Test
ICE	internal combustion engine

IVM	initial vehicle movement
Li-ion	lithium ion
MY	model year`
NiMH	nickel metal hydride
OEM	original equipment manufacturer
PHEV	plug-in hybrid electric vehicle
PHEV10	PHEV with 10 miles of all-electric range on UDDS (unadjusted)
PHEV20	PHEV with 20 miles of all-electric range on UDDS (unadjusted)
PHEV30	PHEV with 30 miles of all-electric range on UDDS (unadjusted)
PHEV40	PHEV with 40 miles of all-electric range on UDDS (unadjusted)
P/W	power-to-weight [ratio]
R&D	research and development
SAE	Society of Automotive Engineers
SI	spark ignition
SOC	state of charge
SUV	sport utility vehicle
UDDS	Urban Dynamometer Driving Schedule
U.S.DRIVE	United States Driving Research and Innovation for Vehicle Efficiency and Energy Sustainability [Program]
VCR	variable compression ratio
VTO	Vehicle Technologies Office
VTS	vehicle technical specifications
VVT	variable valve timing

UNITS OF MEASURE

A	ampere(s)
Ah	ampere-hour(s)
bbl	barrel(s)
°C	degree(s) Celsius

°F	degree(s) Fahrenheit
gal	gallon(s)
h	hour(s)
kg	kilogram(s)
km	kilometer(s)
kW	kilowatt(s)
L	liter(s)
lb	pound(s)
m	meter(s)
m^2	square meter(s)
mi	mile(s)
mpg	mile(s) per gallon
mph	mile(s) per hour
sec	second(s)
V	volt(s
Wh	watt hour(s)

ABSTRACT

The U.S. Department of Energy (DOE) Vehicle Technologies Office (VTO) has been developing more energy-efficient and environmentally friendly highway transportation technologies that will enable America to use less petroleum. The long-term aim is to develop "leapfrog" technologies that will provide Americans with greater freedom of mobility and energy security, while lowering costs and reducing impacts on the environment. DOE's VTO examines pre-competitive, high-risk research needed to develop:

- Component and infrastructure technologies necessary to enable a full range of affordable cars and light trucks.
- Fueling infrastructure to reduce the dependence of the nation's personal transportation system on imported oil and minimize harmful vehicle emissions, without sacrificing freedom of mobility and freedom of vehicle choice.

As part of this ambitious program, numerous technologies are addressed, including engines, energy storage systems, fuel-cell systems, hydrogen storage, electric machines, and materials.

The 1993 Government Performance and Results Act (GPRA) holds federal agencies accountable for using resources wisely and achieving program results. GPRA requires agencies to develop plans for what they intend to accomplish, to measure how well they are doing, to make appropriate decisions on the basis of the information they have gathered, and to communicate information about their performance to Congress and to the public. The present study evaluates the benefits of the light-duty vehicle research conducted at DOE from fuel-efficiency and cost perspectives, to support GPRA activities.

Because of the large number of component and powertrain technologies considered, the benefits were simulated using Autonomie (Figure 1). Argonne National Laboratory designed Autonomie to serve as a single tool that can be used to meet the requirements of automotive engineering throughout the development process, from modeling to control. Autonomie, a forward-looking model developed using MathWorks® tools, offers the ability to quickly compare a very large number of powertrain configurations and component technologies from the perspective of performance, fuel-efficiency and cost.

FIGURE 1 Autonomie Software.

This report reviews the results of the DOE VTO. It gives an assessment of the fuel and light-duty vehicle technologies that are most likely to be established, developed, and eventually commercialized during the next 30 years (up to 2045). Because of the rapid evolution of component technologies, this study is performed every two years to continuously update the results based on the latest state-of-the-art technologies.

While it is not possible to simulate all the different combinations, more than 5,000 vehicles were simulated in the study to take the following into account multiple:

- Powertrain configurations (i.e., conventional, power-split, extended-range electric vehicle, battery electric drive and fuel cell vehicles…),
- Vehicle classes (i.e., compact car, midsize car, small sport utility vehicle [SUV], large SUV, and pickup), and
- Fuels (i.e., gasoline, diesel, compressed natural gas, ethanol and electricity).

These technologies were assessed for six different timeframes (lab year) — reference (2010), 2015, 2020, 2025, 2030, and 2045. A delay of 5 years is assumed between lab year and model year (introduction in production) Finally, uncertainties were included for both performance and cost aspects by considering three cases:

- Low case (10% uncertainty) — aligned with original-equipment-manufacturer improvements based on regulations,
- Average case (50% uncertainty), and
- High case (90% uncertainty) — aligned with aggressive technology advancement based on DOE's VTO.

This report provides an assessment of the fuel displacement and cost-reduction potentials of advanced technologies up to the year 2045, including uncertainties.

EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) Vehicle Technologies Office (VTO) supports new technologies to increase energy security in the transportation sector at a critical time for global petroleum supply, demand, and pricing. Consequences of our vehicles' dependence on oil as their source of energy were shown by the "first oil shock" brought on by the petroleum embargo of October 1973 and the "second oil shock" of 1979. However, this oil dependence continues to increase unabated to the present, and the oil price run-up of July 2008 (to $147 per barrel of crude) illustrated the rapidity with which these discontinuities can occur. As such, the lack of widely available and viable alternative non-petroleum-based fueling options for ground transport vehicles constitutes a high risk to stable economic activity. Some means of providing energy to move vehicles that greatly reduces or eliminates petroleum consumption must be developed. This challenge is greatly complicated by the fact that virtually all alternatives have some inherent fossil-fuel component. The U.S. Transportation sector used about 14 million barrels of oil equivalent per day in 2015 (Figure 2). U.S. Transportation fuel consumption accounts for over 70 percent of total U.S. oil consumption, and more than 65 percent of that amount is for personal vehicles. American drivers consume about 9 million barrels of gasoline per day for personal transportation, about 45 percent of total U.S. oil consumption. The VTO focuses on ground transportation vehicles because of their dominant contribution to the nation's oil use.

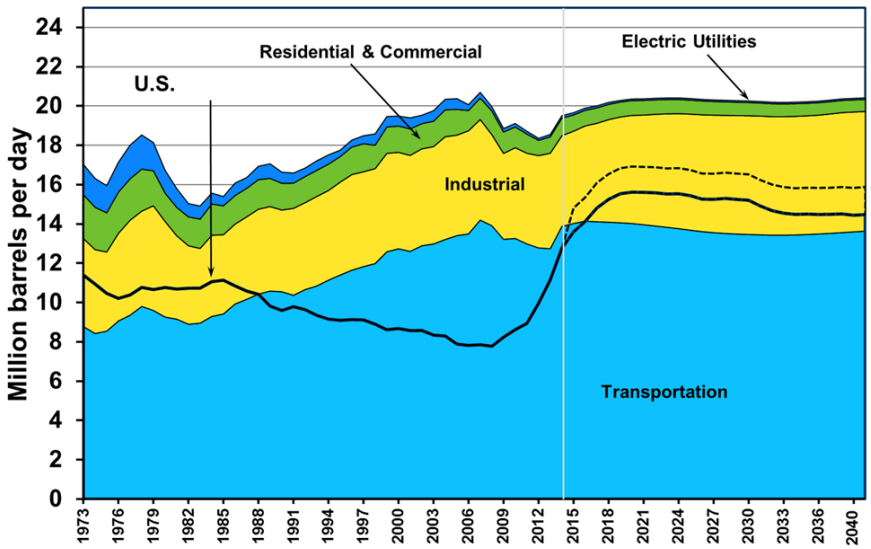


FIGURE 2 U.S petroleum production and consumption by sector 1973-2040 (energy.gov)

The VTO collaborates with industry to identify priority areas of research needed to develop advanced vehicle technologies to reduce and eventually eliminate petroleum use, and to reduce emissions of greenhouse gases, primarily carbon dioxide, from carbon-based fuels. The VTO works on numerous technologies, including the following:

- Development of hybrid electric vehicles (HEVs) and plug-in HEVs (PHEVs), through advanced batteries, electric machines and power electronics.
- Deployment of alternative fuels.
- Vehicle light-weighting.
- Improved combustion technologies and optimized fuel systems.

The objective of the present study is to evaluate the benefits of the DOE VTO for a wide range of vehicle applications, powertrain configurations, and component technologies for different timeframes, and to quantify the potential future petroleum displacement up to 2045, as well as the cost evolution. More than 5,000 light-duty vehicles were simulated with Autonomie, Argonne National Laboratory's vehicle simulation tool.

To address performance and cost uncertainties, three cases were considered: low (10%), average (50%), and high (90%) uncertainty. When available, the assumptions were based on goals of the United States Driving Research and Innovation for Vehicle Efficiency and Energy Sustainability (U.S. DRIVE) Program. The other assumptions were developed through discussions with experts from companies, universities, and the national laboratories.

Several hundred assumptions were necessary to define each vehicle. Some of the main assumptions are highlighted below:

- The difference in peak efficiency between gasoline and diesel engines is expected to narrow in the future because of the combination of advanced gasoline engine technologies and the impact of evermore stringent after-treatment for diesel.
- Coupling ultra-capacitors with batteries was not considered, owing to higher cost and expected increase in lithium ion battery life and cold-start performance in the short term.
- Because of the drive quality requirements in North America, automated manual transmissions were not included in the study.

The main results related to vehicle sizing, fuel efficiency, and cost are highlighted in the following sections.

ES.1 Vehicle Powertrain Sizing

Advances in material substitution will play a significant role in reducing overall vehicle weight and, consequently, component power and energy requirements.

- Because of the impact of the component max-torque curves, maintaining a constant power-to-weight (P/W) ratio between all configurations leads to an inconsistent comparison between technologies due to different performances. Each vehicle should be sized independently to meet specific vehicle technical specifications (VTS).
- Reducing the vehicle weight ("lightweighting") has greater influence on electric drive vehicles (EDVs) than on their conventional counterparts due to the impact of the battery weight on EDVs.
- While performance (i.e., lapsed time for 0–60 mph) is the primary factor used to size components for current technologies, aggressive future lightweighting can make gradeability requirements one of the critical sizing criteria.
- Vehicle weight decreases from 14% to 65% by 2045 across powertrain configurations. The weight reduction, however, varies with the configuration. For the configurations using an engine, the weight reduction for the gasoline conventional powertrain ranges from 14% to 35%, power-split HEVs from 18% to 40%, low-energy PHEVs (with all-electric ranges [AERs] of 10 and 20 mi) from 20% to 42%, and high-energy PHEVs (30- and 40-mi AERs) from 26% to 47%. Configurations with fuel-cell systems demonstrate a larger weight reduction, with fuel-cell HEV weight reductions ranging from 22% to 44%, low-energy PHEV10s and PHEV20s (i.e., 10- and 20-mi AERs) from 25% to 48%, and high-energy PHEV30s and PHEV40s (30- and 40-mi AERs) from 27% to 50%. Finally, battery-powered electric vehicles (BEVs) achieve a weight reduction ranging from 26% to 50%. Overall, significant weight reductions can be achieved compared with current technologies, especially for vehicles with large batteries.
- Most of the component peak powers show a strong linear correlation with vehicle weight. As a result, it is necessary to include secondary effects when analyzing the lightweighting benefits.
- Because of lightweighting and component efficiency improvements, the peak power of engine and fuel-cell systems could be significantly reduced over time to meet current VTS. Engine peak

power could be reduced by 2045 over a 14% to 27% range for conventional gasoline, 21% to 39% for gasoline power-split HEVs, and 22% to 43% for low-energy and high-energy PHEVs. As seen for vehicle weight, hydrogen-fueled vehicles demonstrate a larger peak-power improvement than gasoline-fueled vehicles over time, with fuel-cell system power decreasing in the range of 20% to 41% for HEVs, 22% to 44% for low-energy PHEVs, and 24% to 46% for high-energy PHEVs.

- Battery peak power is also expected to decrease over time to meet current vehicle performance. The battery power is expected to decrease up to 50% for gasoline-engine HEVs and PHEVs.
- Battery total energy will be decreasing significantly owing to other component improvements, as well as a wider usable state-of-charge (SOC) range. The reduction in energy required for PHEVs and BEVs could range from 24% to 51% by 2045.
- While the fuel selection influences the engine size for conventional vehicles (i.e., diesel has lower peak power than gasoline due to higher maximum torque at low speed), the power required to meet the VTS for EDVs is comparable across all fuels.

The different PHEVs show a linear relationship between the usable battery energy and the vehicle mass, with the slope increasing with the AER.

ES.2 Vehicle Fuel Efficiency

Overall, the combination of technology improvements leads to significant fuel-consumption reduction across vehicle applications. As a result, significant fuel can be displaced over the next few decades.

ES.2.1 Evolution of Fuel Consumption Compared with Reference 2010 lab Gasoline Conventional Vehicle

Table ES-1 shows the adjusted fuel-consumption reduction by 2045, on the combined driving cycle, for each powertrain configuration and fuel, compared with the reference gasoline conventional vehicle.

The results demonstrate significant improvements over time across all powertrain configurations and fuels (Table ES-1). When considering the high-uncertainty case across all engines, conventional vehicles can achieve a 23% to 58% fuel-consumption improvement; engine HEVs, 57% to 81%; engine PHEV10s, 65% to 84%; and engine PHEV40s, 58% to 91%. Fuel-cell vehicles achieve an improvement of up to 81% for HEVs, 84% for PHEV10s, and 89% for PHEV40s.

TABLE ES-1 Percentage fuel-consumption reduction of each powertrain by 2045, compared with reference 2010 gasoline conventional powertrain

Fuel\Powertrain	Conventional	HEV	PHEV10*	PHEV40*
Gasoline	28–49	61–75	70–81	82–91
Diesel	38–56	57–72	65–78	82–89
CNG	23–43	61–72	69–78	58–62
Ethanol	39–58	65–76	72–81	81–90
Fuel cell		71–81	77–84	83–89

*Electrical consumption is not taken into account for PHEVs.

ES.2.2 Evolution of Specific Powertrains

Table ES-2 shows the 2045 adjusted fuel-consumption reduction on the combined driving cycle for each powertrain configuration and fuel, compared with each configuration's current status in 2010 (e.g., the diesel HEV in 2045 is compared with the reference diesel HEV in 2010).

The results demonstrate that the maximum improvement expected for each powertrain technology compared with its current status ranges from 17% to 65%. The range depends on fuels (i.e., diesel vehicles show less improvement than gasoline vehicles) and powertrain (i.e., conventional engines have a lower maximum improvement than that of PHEV40 engines).

TABLE ES-2 Percentage fuel-consumption reduction for each powertrain by 2045, compared with the respective current status (values reflect the uncertainty range)

Fuel\Powertrain	Conventional	HEV	PHEV10	PHEV40
Gasoline	28–49	41–61	42–62	34–65
Diesel	25–46	34–57	35–58	37–63
Ethanol	31–53	39–58	40–59	34–65
CNG	17–38	48–53	49–63	21–27
Fuel cell		35–56	36–56	35–57

ES.2.3 Powertrain Comparisons

Comparison of powertrain configurations shows the following:

- Conventional gasoline vehicles versus engine HEVs:
  - The fuel-consumption reductions due to hybridization increase over time for all power-split HEVs: 35% in 2010 versus 47% to 51% in 2045.

  - For gasoline HEVs, fuel-consumption reductions range from 43% to 47% for compact cars, 47% to 51% for midsize cars, 48% to 53% for small SUVs, 48% to 54% for large SUVs, and 48% to 57% for pickup trucks. It appears that heavier vehicles benefit more from hybridization.

- Conventional gasoline vehicles versus engine PHEVs:
  - The fuel-consumption reduction observed for PHEVs relative to conventional gasoline vehicles remains fairly constant over time, ranging from 52% to 56% (PHEV10) and 71% to 79% (PHEV 40).
  - However, while the percentages decreased for higher vehicle weight classes, the benefits remained fairly constant across platforms.

- Conventional gasoline vehicles versus fuel-cell HEVs:
  - The current fuel-consumption reductions for fuel-cell HEVs compared with conventional gasoline vehicles are 56% for midsize cars, 53% for small SUVs, 56% for large SUVs, and 55% for pickups.
  - Because of expected improvements in fuel-cell system and hydrogen-storage technologies, the fuel-consumption percentage improvements are expected to slightly increase over time. By 2045, the benefits will increase from 60% to 62%, depending upon the vehicle class and uncertainties considered. The reason why the increase is not larger is mainly due to the introduction of start/stop systems rather than a regular conventional vehicle in 2030.

- Engine HEVs versus fuel-cell HEVs:
  - Fuel-cell system technology offers consistently lower fuel consumption than power-split HEV technology.
  - The current fuel-consumption benefits of fuel-cell HEVs compared with gasoline power-split HEVs are fairly constant across all vehicle classes and are about 33%.
  - Because of the engine and fuel-cell system operating conditions for HEVs, the fuel-consumption improvement remains constant across all vehicle classes. However, the percentage is expected to decrease to 23% to 26% by 2045.

ES.2.4 Evolution of Fuel Comparisons

Comparison of fuel types shows the following:

- Gasoline versus diesel:
  - The fuel consumption for conventional vehicles will tend to decrease in the future.

- For conventional vehicles, the fuel-consumption advantage of diesel engines goes from 18% in 2010 to 13% to 14% in 2045.
- For HEVs, the fuel consumption benefit of diesel is smaller than for conventional vehicles, about 1% in 2010, and the position of one with respect to the other is reversed by 2045.
- Similarly, for PHEVs, the benefits of diesel compared with gasoline are minimal.
- However, diesel engines retain the best fuel consumption for the vast majority of uncertainties and timeframes.

- Ethanol:
  - Ethanol-fuel conventional vehicles are expected to narrow their fuel-consumption penalty over gasoline engines with time, from 12% in 2010 to 16% to 19% in 2045.
  - The fuel-consumption penalty for ethanol deceases for increased hybridization degree and battery energy, with a 3% to 9% of fuel-consumption penalty in 2045.

ES.3 MANUFACTURING COST

Overall, the combination of technology improvements leads to significant manufacturing cost reduction across vehicle applications. As a result, advanced technologies are expected to have significant market penetration over the next decades.

ES.3.1 Cost Evolution Compared with Reference 2010 Gasoline Conventional Vehicle

Table ES-3 shows the additional manufacturing cost by 2045, compared with the reference gasoline conventional vehicle. The table shows a significant uncertainty range for the additional manufacturing cost across all technologies. This high uncertainty highlights the need to pursue aggressive research over the next decades to bring the cost of advanced technologies to a level that will favor high market penetrations.

TABLE ES-3 Additional manufacturing cost of each powertrain by 2045, compared with reference 2010 gasoline conventional engine for midsize cars ($)

Fuel\Powertrain	Conventional	HEV	PHEV10	PHEV40
Gasoline	900-1,600	2,400–2,600	2,600–2,800	3,900–4,500
Diesel	2,100–2,500	3,500–3,600	3,800–3,900	4,900–5,700
CNG	2,100–2,500	2,700–3,100	3,000–3,400	4,100–5,400
Ethanol	800–1,500	2,400–2,600	2,600–2,800	3,900–4,500
Fuel cell		2,600–3,900	2,900–4,100	3,500–5,300
BEV100	900–1,300			
BEV200	2,200–4,500			
BEV300	3,600–8,000			

ES.3.2 Evolution of Costs for Specific Powertrains

Table ES-4 compares the percentage change in the manufacturing cost between 2010 and 2045 for each configuration relative to its current value.

Vehicle manufacturing costs for gasoline, diesel, compressed natural gas (CNG), and ethanol conventional vehicles increase over time because of several factors, including lightweighting and advanced component technologies such as direct injection. In contrast, the greatest reductions are noticed for the vehicles with high-energy batteries and fuel-cell systems.

Because of the expected improvements in batteries, the higher the battery energy, the greater will be the manufacturing cost reduction. As a result, PHEV40s demonstrate a larger cost reduction than PHEV10s across all fuels. PHEV40s with gasoline engines show cost reductions ranging from 26% to 28% from 2010 to 2045, while PHEV10s only show a cost reduction ranging from 14% to 15%.

The fuel-cell vehicle manufacturing costs decrease significantly over time. From 2010 to 2045, the manufacturing costs for the fuel-cell HEV decreases by 27% to 32%, for the fuel-cell PHEV10 by 30% to 35%, and for the fuel-cell PHEV40 by 38% to 43%. Notice that conventional vehicles (negative decrease) tend to increase in cost by 2045. This is mainly due to glider cost increase overtime whereas no other component benefit from cost reduction overtime. On the other hand hybrid vehicle do get cheaper due to advances in battery technology and costs reductions overtime.

TABLE ES-4 Manufacturing cost reduction for each powertrain by 2045, compared with the respective current manufacturing cost, for midsize cars (%)

Fuel\Powertrain	Conventional	HEV	PHEV10	PHEV40
Gasoline	-11– -6	7–8	14–15	26–28
Diesel	-2–0	14	21	29–32
CNG	3–6	17–19	23–24	32–36
Ethanol	-11– -6	8–9	14–15	26–29
Fuel cell		27–32	30–35	38–43
BEV100	26–28			
BEV200	38–46			
BEV300	47–57			

ES.3.3 Powertrain Comparison

The manufacturing cost differences between different powertrain options tend to decrease over time. In 2010, for midsize cars, the gasoline power-split HEV is 28% more expensive than the conventional

vehicle, the PHEV10 41% more expensive, and the PHEV40 80% more expensive. By 2045, these percentages are 7% for HEVs, 8% for PHEV10s, and 15% for PHEV40s.

ES.3.4 Fuel-Comparison Evolution

Comparison of gasoline versus diesel shows the following:

- The conventional diesel vehicle manufacturing cost will remain between 6% and 7% more expensive than gasoline vehicles by 2045.
- The diesel HEV is between 10% and 12% more expensive to manufacture than the gasoline HEV, but this difference tends to decrease after 2010 and fall to 6% by 2045.

ES.4 CONCLUSION

Technology improvements lead to significant energy consumption and cost reductions across light-duty vehicle applications. Because of the technologies' evolution uncertainty considered, research should continue to be conducted in the different areas showing high potential.

Because of expected improvements, advanced technologies are expected to have a significant market penetration over the next decades. In the short term, both engine HEVs and PHEVs allow for significant fuel displacement with reasonable additional cost. For the long term, fuel cell vehicles and battery electric vehicles demonstrate very high fuel displacement potential at a competitive cost.

This research will be updated every two years to include the latest powertrain technologies and component technologies, as well as additional timeframes and vehicle applications.

1 INTRODUCTION

1.1 THE ENERGY SITUATION

The current international energy situation has brought about serious concerns in most of the developed countries about their use of fossil fuels and their need for developing renewable energy sources. This energy crisis takes place in the context of oil-stock reduction and a dramatic demand increase from developing countries. A study by Wang (2006) shows that Chinese on-road vehicles could consume up to 20.6 million bbl of oil per day by 2050. Moreover, China could face a tremendous increase in highway vehicles (including cars, trucks, and buses) in the next 40 years. Indeed, depending upon the case scenario developed in the study, there could be between 486 and 662 million highway vehicles in China in 2050, compared with roughly 27 million in 2004. A significant increase in vehicle number in numerous countries could severely impact GHG and the oil market. The dilemma cannot be solved without creating new energy and/or transportation systems that either consume less oil or are not dependent on oil.

With a consumption of almost 19 million bbl/day, the United States is by far the world's highest-oil-consuming country. The United States, with only 4.5% of the world's population, consumes almost a quarter of the world's oil.

Only 49% of the oil imported by the United States (8.1 million bbl/day) comes from the Western hemisphere; the rest is imported from other regions of the world, such as Africa and the Persian Gulf (20% and 16%, respectively, of the imported oil). The unstable and unpredictable political situations in these regions have led the United States to focus on reducing its oil dependency through various programs in different sectors.

The U.S energy consumption distribution per fuel. According to the EIA, the transportation sector is almost entirely dependent on oil as its primary energy source. Such a strong dependence on oil has important consequences for the current world energy situation. The price of oil barrel will tend to stay high and steadily increase with time.

To address the issue, the U.S. government, and in particular the U.S. Department of Energy (DOE), has developed various projects to find alternative energy solutions for the transportation domain. Among the different possibilities that could be the key for the future, three main categories can be highlighted:

- The development of inexpensive and high-energy batteries to enable the commercialization of hybrid electric vehicles (HEVs) and plug-in hybrid electric vehicles (PHEVs). PHEVs would allow the driver to travel certain distances in electric-only mode and charge the vehicle overnight by plugging the car into the regular electric network.
- The development of biofuels such as ethanol. The current ethanol vehicles (also called flex-fuel or E85 vehicles) use a fuel made of 85% ethanol and 15% gasoline.
- The development of fuel-cell vehicles that would entirely eliminate oil dependency.

1.2 American Automotive Market

The automotive market in the United States has greatly evolved over the past 30 years. These modifications include not only the distribution of vehicle types sold but also changes in performance, weight, and thus fuel consumption for all light-duty vehicles. Prior to the oil embargo of 1973, domestic oil was inexpensive and abundant, and car companies produced large and heavy cars with powerful engines and poor fuel economy. A combination of events, including increasing public desire for better fuel economy, increasing concern about carbon emissions that resulted in state regulations on fuel economy and carbon emissions, key court decisions, and a stated desire by the federal executive branch to decrease gasoline consumption, led to increasing Corporate Average Fuel Economy (CAFE) standards, which automakers preferred to state-level regulations.

Figure 3 shows the fuel-economy evolution for both cars and trucks. In 1975, a dramatic increase in fuel economy began, and passenger-car fuel economy reached its peak in 1988, when cars averaged 24 mpg (a 71% improvement compared with 1975). However, since 1988, fuel economy has remained constant at about 23 mpg for cars, and if we consider all light-duty vehicles, it has even gradually declined from 1988 to 2004. Finally, since 2004, the light-duty-vehicle adjusted fuel economy has increased from 20.2 mpg in 2006 to 21.2 mpg in 2009. Since tailpipe carbon dioxide (CO_2) emissions have an inverse relationship to fuel economy, emissions showed a rapid decrease from 1975 through 1981; a slower decrease to a valley in 1987; a gradual increase until 2004; and a decrease for the 6 years beginning in 2005, with the largest decrease in 2009. Note that model year (MY) 2015 had the highest fuel economy.

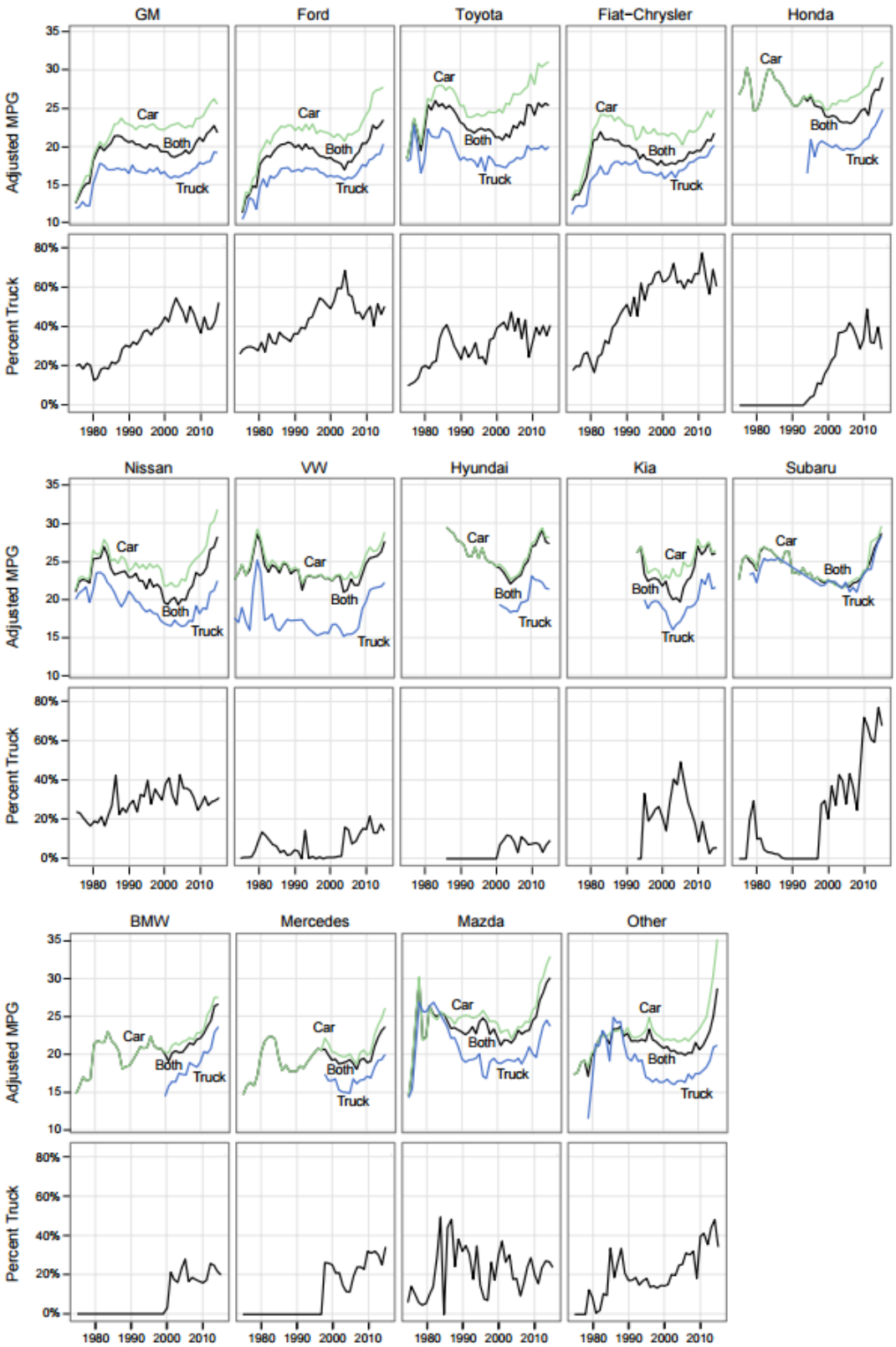


FIGURE 1 Light-duty automotive technology, fuel economy, and emission trends: 1975 through 2015 (Source: EPA 2015)

A study from the Civil Society Institute (CSI 2007) states that the average fuel economy of European light-duty vehicles is about 40 mpg, twice as high as in the United States. Also, CSI reports that, in 2008, only two cars in the United States (Honda Civic Hybrid and Toyota Prius) achieved 40+ mpg, whereas 113 cars in Europe could claim such an achievement. Although this number has recently increased, American customers still prefer larger and more powerful cars, such as pickup trucks and sport utility vehicles (SUVs). As a result, the most efficient vehicles do have a significant penetration in the U.S. automotive market.

Figure 4 shows the U.S. sales fractions for four different classes of light-duty vehicles: cars, SUVs, vans, and pickups. If we group the last three vehicle types under the truck category, we notice that nearly half of the light-duty vehicles sold in 2007 were "trucks." In addition, the truck sales fraction has been increasing for the past 20 years. However, because of higher gasoline prices in 2008, the pickup truck sales fraction decreased from 13% in February 2008 to 9.1% in May 2008. Also, from June 2007 to June 2008, SUV sales dropped 54.7% and pickup truck sales dropped 35.6%, reflecting a deep change in consumer behavior and expectations. Van and pickup truck sales continued to decrease in the following years until 2009. Truck market share is now at the lowest level since MY 1995. The MY 2015 light-truck market share is projected to be above 50%, based on pre-MY production projections by automakers.

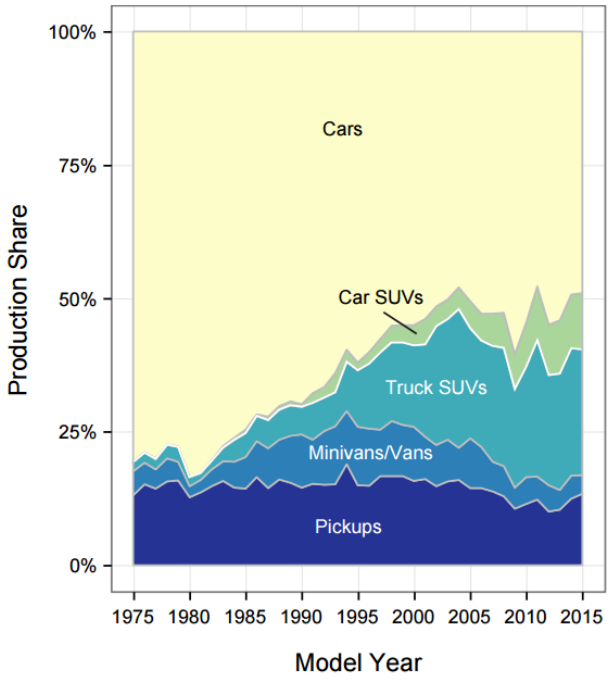


FIGURE 2 Light-duty automotive technology and market share trends: 1975 through 2015 (Source: EPA 2015)

Vehicle weight and performance are two of the most important engineering parameters that help determine a vehicle's CO_2 emissions and fuel consumption. Figure 5 shows that the change in light-vehicle weight has been stabilizing since 2005. On the other side, vehicle power seems to have steadily increased. The fuel economy has been steadily increasing since 2005 as well and the estimated MY 2015 0-to-60 mph acceleration time is less than 9 sec (Figure 6).

In summary, the American automotive market is steadily changing, with automakers trying to adapt their light-duty-vehicle offerings to consumers' needs.

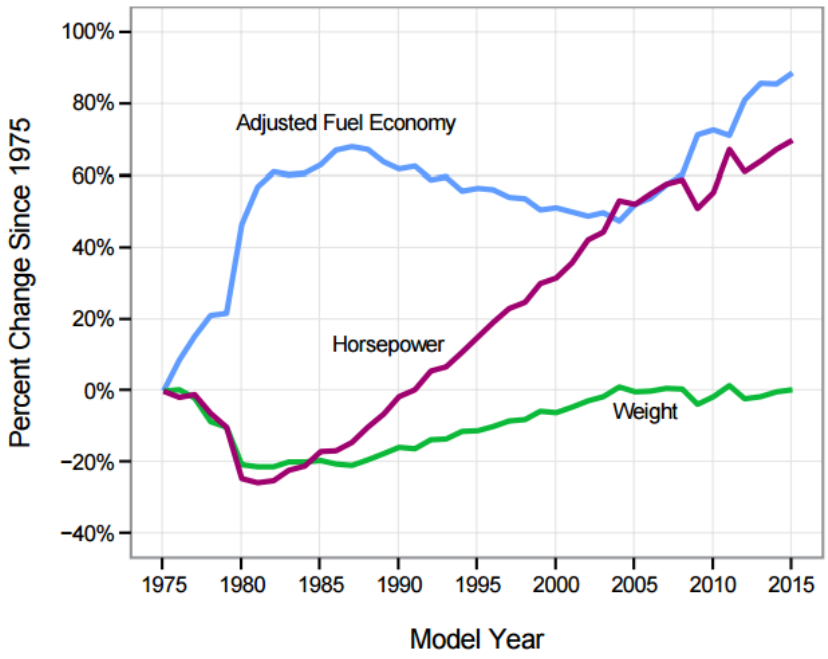


FIGURE 3 Vehicle weight and power evolution from 1975 to 2015 (Source: EPA 2015)

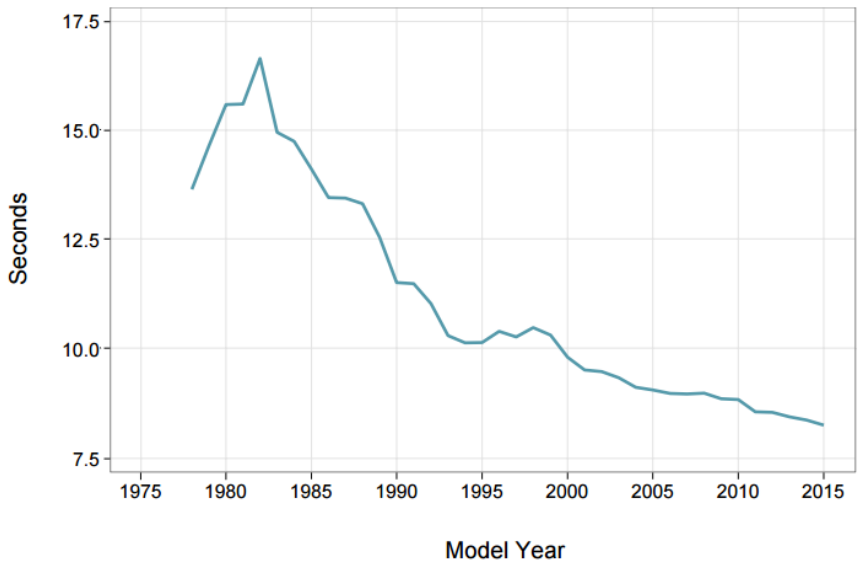


FIGURE 4 Calculated 0-to-60 mph acceleration performance (Source: EPA 2015)

1.3 HYBRID ELECTRIC VEHICLES

1.3.1 Characteristics

Hybrid electric vehicles are powered by at least two different sources of energy. In general, they combine an electrical storage system (i.e., battery, ultra-capacitor, etc.), heat engine, and fuel-cell system.

The idea behind HEVs is to combine the advantages of conventional vehicles and battery-powered electric vehicles (BEVs), so as to limit the drawbacks of each. Electric vehicles have excellent efficiency, owing to high electric-machine efficiency (usually above 80% average on a cycle) and low battery losses. Furthermore, they can recover part of the energy usually lost during deceleration. For BEVs, batteries are the critical component due to their cost and life.

HEVs offer the following features:

- **Idling stop**: The engine is turned off at zero vehicle speed to avoid idling. The engine is started using the electric machine. Depending on the electrical power available, the engine is started as soon as the vehicle moves (low power) or at higher vehicle speeds (high power).
- **Braking energy recovery**: The energy usually wasted by friction during deceleration can be recovered as electrical energy thorugh an electric machine. The process is often called regenerative braking, as it regenerates (part of) the energy that the vehicle had to provide to overcome the effect of inertia when accelerating.

- **Electric only propulsion**: When the electric machine and the battery have respectively sufficient power and energy, they can be used alone to propel the vehicle, particularly to avoid operating the engine at low load and low efficiency.
- **Electric machine assist**: At high power demand (i.e., when accelerating), the electric machine can assist the engine, allowing downsizing, improved powertrain efficiency, lower transients and emissions…

The features mentioned above are not all available for all HEVs and depend on the powertrain configurations considered. Section 1.3.2 provides an overview of the main families of HEVs.

1.3.2 Primary Powertrain Configurations

The various electrified powertrain configurations can be classified on the basis of their hybridization degree, as shown in Figure 7. The hybridization degree is defined as the percentage of total power that can be delivered electrically. The higher the hybridization degree, the greater the ability to propel the vehicle using electrical energy.

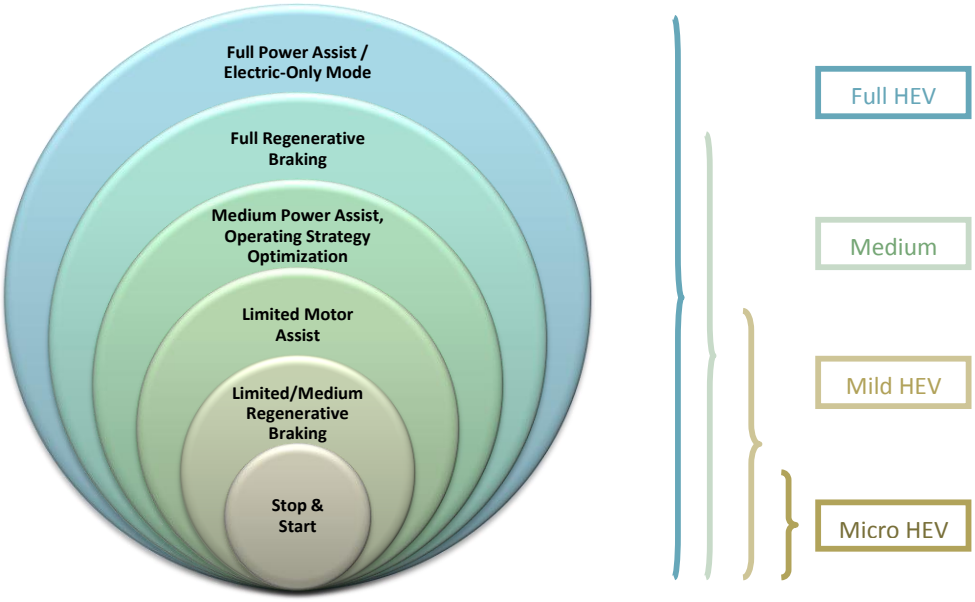


FIGURE 5 Hybridization degrees for HEVs

There are numerous hybrid powertrain designs. The main families are described below and illustrated in Figure 8.

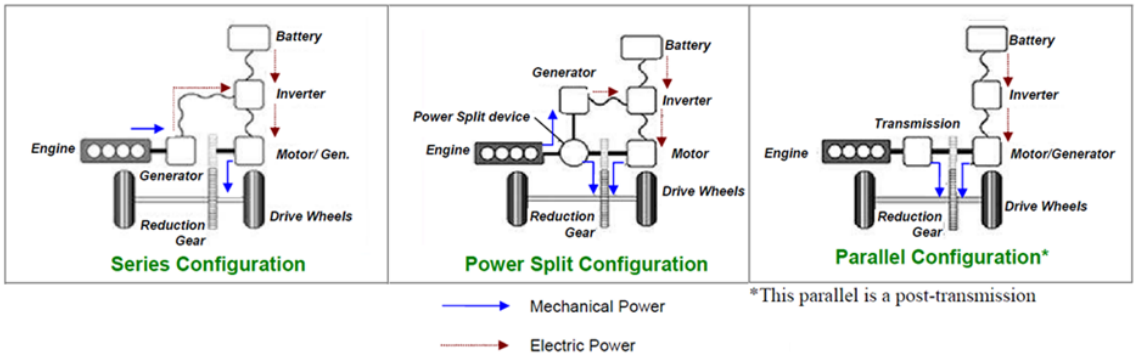


FIGURE 6 HEV Powertrain Configurations

1.3.2.1 Series Configuration

The first HEVs were generally based on a series configuration. In this case, the vehicle is propelled solely by electrical energy. When an engine is used, it provides a generator with mechanical power, which then converts it into electricity. In the case of a fuel-cell system, the electrical energy is directly used by the electric machine. The main advantage is that the engine speed is decoupled from the vehicle speed, allowing an operating condition at or close to its most efficient operating point. The main drawback is that the main components have to be oversized to be able to maintain the same performance, which leads to higher vehicle weight.

1.3.2.2 Parallel Configuration

In a parallel configuration, the vehicle can be directly propelled by either electrical or mechanical power. Direct connection between the energy sources and the wheels leads to lower powertrain losses compared with the pure series configuration. However, since all of the components' speeds are linked to the vehicle's speed, the engine cannot constantly be operated close to its best efficiency curve.

Several subcategories exist within the parallel configuration:

- Start-stop: A small electric machine is used to turn the engine off when the vehicle is stopped.
- Starter-alternator: This configuration is based on a small electric machine (usually 5 kW to 15 kW) located between the engine and the transmission. Because of the low electric-machine power, this configuration is mostly focused on reducing consumption by eliminating idling. While some energy can be recuperated through regenerative braking, most of the negative electric-machine torque available is usually used to absorb the engine's negative torque.
- Pre- and post-transmission: Both configurations allow the driver to propel the vehicle in electric-only mode as well as recover energy through regenerative braking. The electric-machine power

usually ranges from 20 kW to 50 kW. The main difference between these two options is the location of the electric machine (before or after the transmission). The post-transmission configuration has the advantage of maximizing the regenerative energy path by avoiding transmission losses. On the other hand, the pre-transmission configuration can take advantage of different gear ratios that allow the electric machine to operate at higher efficiency and provide high torque for a longer operating range.

1.3.2.3 Power-Split Configuration

The power-split configuration, composed of an engine and two electric machines, allows both parallel and series paths. The main feature is that all component speeds are decoupled, which allows a higher degree of control.

It is important to note that many different variations exist within each configuration (e.g., power-split configurations can be single-mode, two-mode, or three-mode) and among configurations (i.e., several configurations are considered to be a mix of series, parallel, and/or power-split). Overall, several hundred configurations are feasible for electric-drive vehicles (EDVs).

1.3.3 HEV Market

Figure 9 shows the evolution of the HEV market from 1999 to 2015. The first HEV introduced in the American market was the Honda Insight in 1999. It was a small two-seater with an aggressive design that has had limited success despite its excellent fuel economy (49 mpg city and 61 mpg highway in MY 2000, according to the U.S. Environmental Protection Agency [EPA]).

Toyota released its first Prius in the United States in 2000, and Honda released its hybrid version of the popular Civic in 2002. After a redesigned, larger version of the Toyota Prius was released in 2004, the sales significantly increased and exceeded sales of the Civic Hybrid.

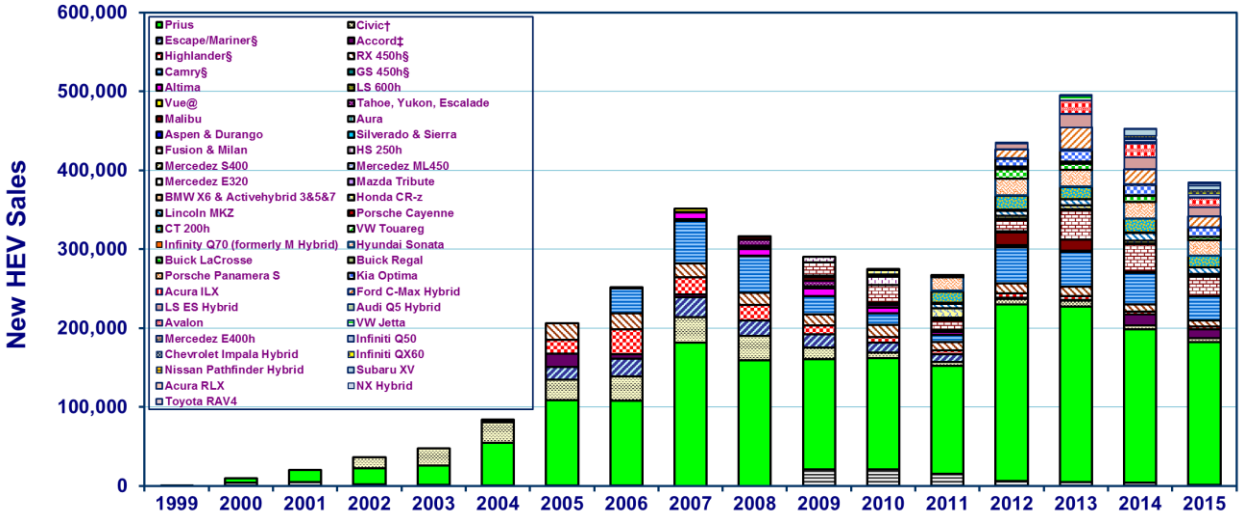


FIGURE 7 HEV sales in the United States from 1999 to 2015 (Source: Zhou 2016)

Since 2000, the HEVs offered have expanded across multiple carmakers and vehicle classes. In 2007, HEV sales increased by 38% compared with 2006 and represented 2.2% of the total vehicle sales in the United States (Figure 10). Several reasons explain the decrease of HEV sales from 2007 to 2012:

- Total vehicle sales decreased during that period,
- Economic conditions made people cautious about investing in a more expensive technology, and
- Low fuel price.

As shown in Figure 11, EDV sales also correlate with gasoline prices, since people are more likely to invest in an EDV if gasoline prices are high. For example, between April 2008 and October 2008, the U.S. average gasoline price decreased from $4.10 per gallon to $1.80 per gallon. Simultaneously, HEV sales decreased by more than 50%, with only 15,000 vehicles sold in January 2009. Figure 12 shows sales from 2010 to 2015 for PHEVs by model.

Figure 13 shows U.S. sales of various types of HEVs as percentages of total sales from 1999 to 2015. In 2013, 6% of cars (midsize and large) were HEVs, whereas roughly 0.5% of light trucks (SUVs, trucks, and vans) were HEVs. It can be noticed that HEV market share has slightly decreased since 2013.

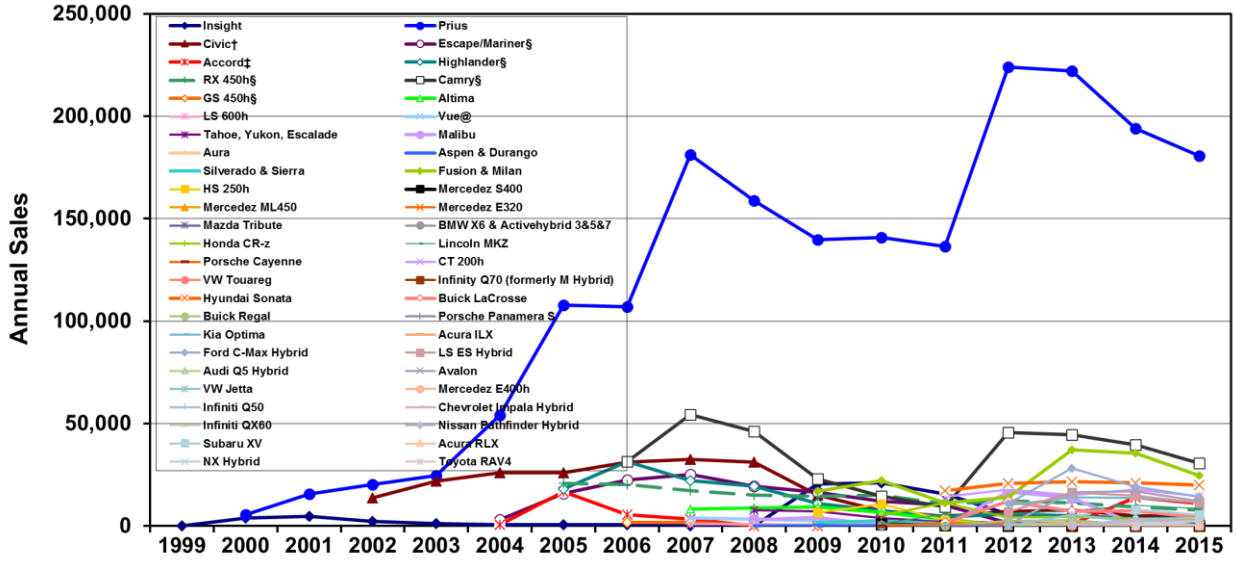


FIGURE 8 U.S. HEV sales trends from 1999 to 2015 (Source: Zhou 2016)

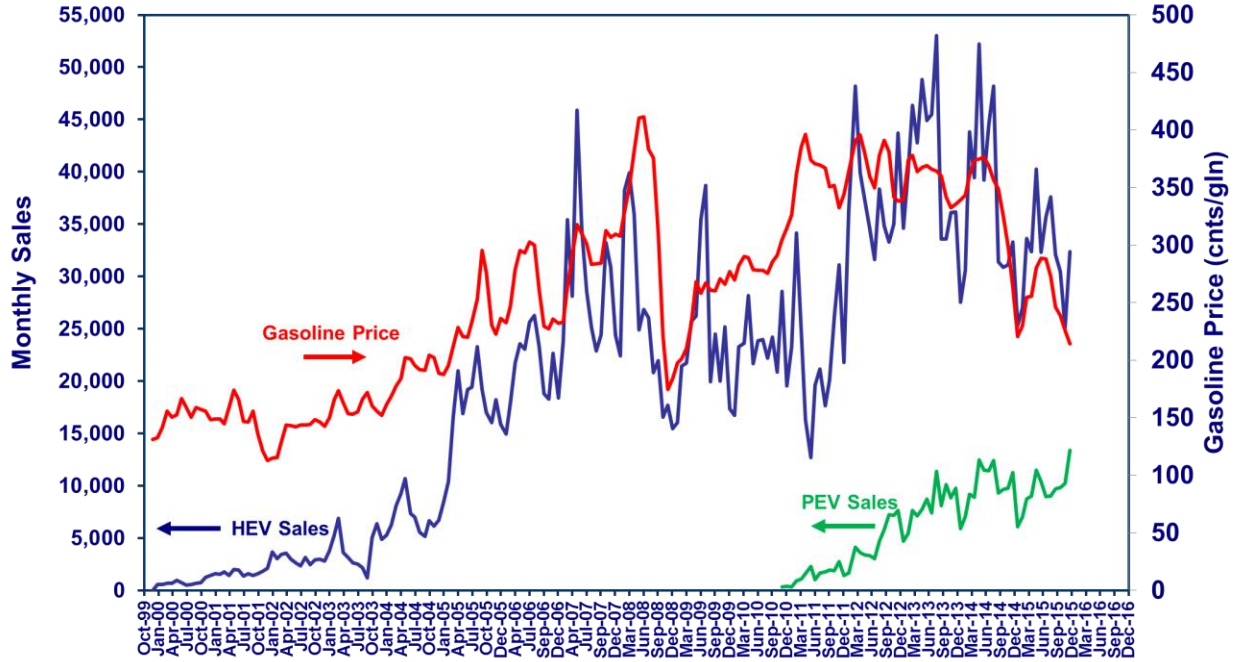


FIGURE 9 Monthly new EDV and PHEV (PEV) sales and gasoline price

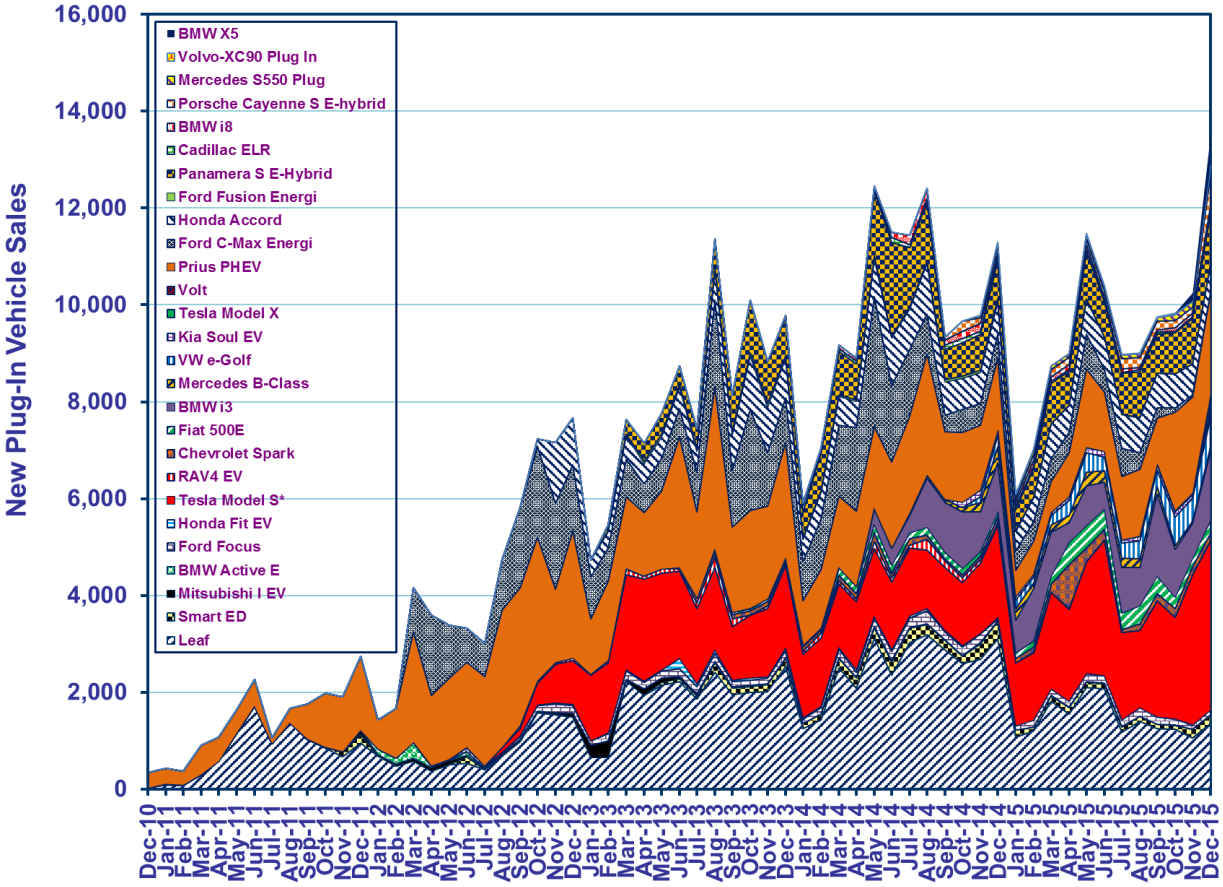


FIGURE 10 PHEV sales by model, 2010–2015 (Source: Zhou 2016)

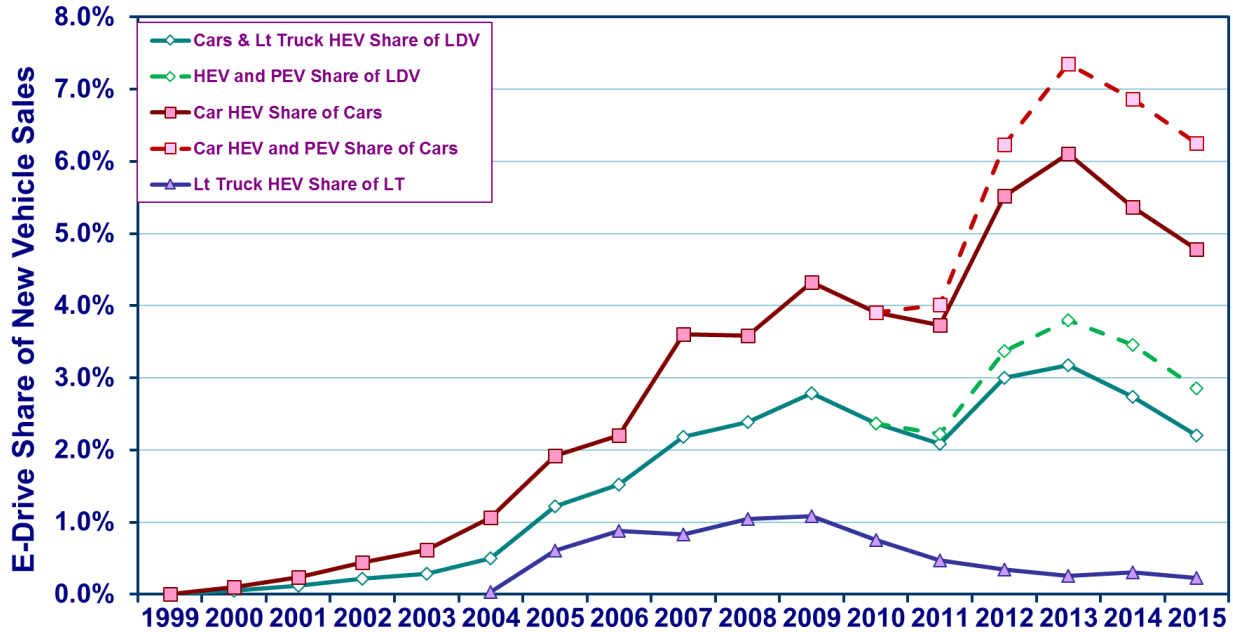


FIGURE 11 EDV car and light-truck sales as share of light-duty vehicle sales in the U.S. (Source: Zhou 2016)

1.4 PLUG-IN HYBRID ELECTRIC VEHICLES

1.4.1 Definition and Characteristics

A PHEV, also called grid-connected HEV or extended-range electric vehicle (E-REV), is an HEV whose batteries can be charged from a wall outlet. In other words, the energy storage system can be plugged into an external electric-power source. Because of their ability to be recharged from an outlet, PHEV batteries have a lower power-to-energy ratio compared with their HEV counterparts (the increase in energy capacity for PHEV batteries versus HEV batteries is more substantial than the increase in power requirements for PHEV batteries versus HEV batteries). Their higher energy and power allow extended usage of the electric-only mode, leading to fewer engine on/off cycles. While the engine is started at a power demand of about 7 kW to 9 kW at the wheel for most midsize HEVs, a PHEV offers the ability to start it at a higher power demand, depending on the battery's available energy, its state of charge (SOC), and the trip distance.

Because of their ability to operate mostly in all-electric mode, PHEVs offer a very promising solution to conventional fuel displacement. PHEVs share many of the powertrain components with HEVs. However, the vehicle's ability to operate in electric mode requires different energy storage system technology and power electronics compared to HEVs:

- **Higher energy**: the batteries have higher capacity and discharge range, as a function of all-electric range (AER);
- **Higher power**: the electric system is in general more powerful, to be able to propel the vehicle under more aggressive driving conditions in EV mode.
- **Increased control freedom**: the higher degree of hybridization allows a greater number of possible electric-machine/engine-power combinations, leading to significant added complexity in determining the optimal vehicle level control strategy compared with HEVs.

The DOE envisions a key future role for HEVs and PHEVs in reducing oil consumption and enabling a dramatic shift from petroleum-based transportation fuels to electricity, taking advantage of U.S. investments in renewable energy that will result in a flexible, clean, and reliable power generation and distribution system in the future. In January 2013, DOE released an electric vehicle plan[1] based on early

[1] *Grand Challenge Blueprint: EV Everywhere*, available on-line at http://energy.gov/sites/prod/files/2014/02/f8/eveverywhere_blueprint.pdf.

benchmark testing of PHEV conversion vehicles (i.e., stock HEVs with added battery capacity and control modifications); vehicle modeling and simulation; and the status of batteries, power electronics, and electric motors in the DOE technology research and development (R&D) programs.

1.4.2 Challenges

1.4.2.1 Battery Technology

Batteries are the most critical technology for PHEVs. They are characterized by

- High capacity, for greater AER (charge depleting [CD]);
- High power, to meet the power demand in all-electric mode;
- High useable SOC—while conventional HEVs use between 10% and 15% of the total battery energy under normal driving conditions, PHEVs use a larger percentage (e.g., 60 to 70% for current vehicles);
- Longer continuous periods of discharge and recharging; and
- Thermal management issues (heating).

The last two points have a major impact on battery life and performance variation.

Lithium batteries are currently the best solution, as they possess twice the specific energy of nickel-metal-hydride (NiMH) batteries. However, they require sophisticated battery-management systems and significant circuitry to prevent overcharge and overdischarge. Furthermore, battery R&D is still needed before long-life, compact, and inexpensive batteries are available. The future market penetration of PHEVs will depend greatly on the success of battery R&D.

1.4.2.2 Electric Machine and Power Electronics

The electric-drive system entails substantial technical and economic challenges as well. PHEVs with full performance (i.e., competitive acceleration and top speed) in electric mode require power electronics and electric machines with twice the power of today's HEVs—at lower cost (this requirement is, however, not considered a "showstopper"). And the need for "smart" onboard battery chargers (to ensure efficient and cost-effective recharging) adds more pressure for cost reduction.

1.4.2.3 Vehicle System

Special attention has to be paid to the design of the vehicle as a system. Because of the existence of two power sources, multiple design and control choices affect overall efficiency. For PHEVs, one of the

key questions is the degree of hybridization, and more particularly, the "zero emission mode." Will the electric machine provide all the mechanical power, or will it be assisted by the intermittent use of the engine? If so, what will be the level of this assistance? Each possible solution has to be considered and the environmental/economic benefits assessed. Several studies have been published to assess the impact of powertrain configuration and component sizing on fuel efficiency (Sharer et al. 2007; Fellah et al. 2009), but more work needs to be performed.

Advanced energy management control strategies will provide the opportunity to use the vehicle at its optimum efficiency (Karbowski et al. 2006; Rousseau and Moawad 2010; Moawad and Rousseau 2012); however, additional applied R&D will be required. One of the current research approaches is to adapt the control strategy to the trip conditions and even to the driver's behavior through optimization.

The ultimate goal is to develop a vehicle that would be beneficial from a macroscopic as well as a customer point of view. Driving habits and patterns have to be reviewed to design one or several types of PHEVs that would be potentially adapted to a significant number of customers.

1.4.2.4 Charging Infrastructure

Charging at home will require appropriate circuits: 240-V alternating current is preferred for Level 2 charging of vehicles with longer electric ranges, compared with the standard U.S. household receptacle voltage of 120 V. Innovative solutions are being developed to provide convenient charging locations (e.g., in garages, parking lots, and other structures) for those who do not have private garages.

In order to prepare for a significant market penetration of PHEVs, utilities are developing their generation facilities as well as specific management of their generation, transmission, and distribution assets to balance the impact of PHEVs on the grid. Specific generation sites are also being developed, such as wind turbines for night charging or "solar" parking for day-charging. The possibility of bidirectional energy flow between the grid and PHEVs will require communication systems to optimize the leveling effect. Numerous studies have been performed and are currently under way to examine these issues.

1.5 INPUT DEVELOPMENTS

The inputs for the present study (i.e., component assumptions, control strategies, vehicle technical specifications [VTS], sizing algorithms, etc.) were developed and regularly updated over several years through numerous discussions with both components and systems experts.

To define an assumption, several experts were contacted independently to provide their input related to their area of expertise for each uncertainty and timeframe considered. At least three experts were contacted before defining an input. The assumptions are discussed in detail in Chapter 3.

2 METHODOLOGY

2.1 AUTONOMIE OVERVIEW

Many of today's automotive control-system simulation tools are suitable for modeling, but they provide rather limited support for model building and management. Setting up a simulation model requires more than writing down state equations and running them on a computer. With the introduction of EDVs, the number of components that can populate a vehicle has increased considerably, and more components translate into more possible drivetrain configurations and powertrain control options. In addition, building hardware is expensive. Traditional design paradigms in the automotive industry often delay control-system design until late in the process—in some cases requiring several costly hardware iterations. To reduce costs and improve time to market, it is imperative that greater emphasis be placed on modeling and simulation. This only becomes truer as time goes on because of the increasing complexity of vehicles and the greater number of vehicle configurations.

With the large number of possible advanced vehicle architectures and time and cost constraints, it is impossible to manually build every powertrain configuration model. As a result, processes have to be automated.

Autonomie (Argonne 2011a; Rousseau undated) is a MATLAB©-based software environment and framework for automotive control-system design, simulation, and analysis. The tool is designed for rapid and easy integration of models with varying levels of detail (low to high fidelity) and abstraction (from subsystems to systems and entire architectures), as well as processes (e.g., calibration, validation). Developed by Argonne National Laboratory (Argonne) in collaboration with General Motors, Autonomie was designed to serve as a single tool that can be used to meet the requirements of automotive engineering throughout the development process from modeling to control. Autonomie was built to accomplish the following:

- Support proper methods, from model-in-the-loop, software-in-the-loop, and hardware-in-the-loop to rapid-control prototyping;
- Integrate math-based engineering activities through all stages of development, from feasibility studies to production release;
- Promote re-use and exchange of models industry-wide through its modeling architecture and framework;

- Support users' customization of the entire software package, including system architecture, processes, and post-processing;
- Mix and match models of different levels of abstraction for execution efficiency with higher-fidelity models where analysis and high-detail understanding are critical;
- Link with commercial off-the-shelf software applications, including GT-Power©, AMESim©, and CarSim©, for detailed, physically based models;
- Provide configuration and database management; and

By building models automatically, Autonomie allows the quick simulation of a very large number of component technologies and powertrain configurations. Autonomie can do the following:

- Simulate subsystems, systems, or entire vehicles;
- Predict and analyze fuel efficiency and performance;
- Perform analyses and tests for virtual calibration, verification, and validation of hardware models and algorithms;
- Support system hardware and software requirements;
- Link to optimization algorithms; and
- Supply libraries of models for propulsion architectures of conventional powertrains as well as EDVs.

Autonomie was used to assess the energy consumption and cost of advanced powertrain technologies. Autonomie has been validated for several powertrain configurations and vehicle classes using Argonne's Advanced Powertrain Research Facility (APRF) vehicle test data (Kim et al. 2015; Kim et al. 2014; Lee et al. 2014; Kim et al. 2013; Kim et al. 2012; Kim et al. 2009; Rousseau et al. 2006; Cao 2007; Rousseau 2000; Pasquier et al. 2001).

With more than 400 different pre-defined powertrain configurations, Autonomie is an ideal tool for analyzing the advantages and drawbacks of the different options within each family, including conventional, parallel, series, and power-split HEVs. Various approaches have been used in previous studies to compare options ranging from global optimization (Karbowski et al. 2009) to rule-based control (Freyermuth et al. 2008).

Autonomie also allows users to evaluate the impact of component sizing on fuel consumption for different powertrain technologies (Nelson et al. 2007; Karbowski et al. 2007) as well as to define the component requirements (e.g., power, energy) to maximize fuel displacement for a specific application (Fellah et al. 2009; Rousseau et al. 2004). To properly evaluate any powertrain-configuration or component-sizing impact, the vehicle-level control is critical, especially for EDVs. Argonne has extensive expertise in developing vehicle-level controls based on different approaches, from global optimization to instantaneous optimization (Karbowski et al. 2010), rule-based optimization (Sharer et al. 2008), and heuristic optimization (Rousseau et al. 2008).

The ability to simulate a large number of powertrain configurations, component technologies, and vehicle-level controls over numerous drive cycles has been used to support many DOE and manufacturer studies. These studies focused on fuel efficiency (Delorme et al. 2008), cost-benefit analysis (Rousseau et al. 2005), or greenhouse gases (Elgowainy et al. 2009; Wu et al. 2006). All the development performed in simulation can then be implemented in hardware to take into account non-modeled parameters, such as emissions and temperature (Vijayagopal et al. 2010).

Autonomie is the primary vehicle simulation tool selected by DOE to support its U.S. DRIVE Program and Vehicle Technologies Office (VTO) (DOE undated b; Vehicle Systems Analysis Technical Team 2006). Autonomie has been used for numerous studies to provide the U.S. government with guidance for future research (www.autonomie.net). More than 175 companies and research entities, including major automotive companies and suppliers, are also using Autonomie to support advanced vehicle development programs.

2.2 Study Process

The process to estimate the energy consumption of various advanced powertrains can be divided into three steps:

- **Define the architecture.** The vehicle architecture is built using the different components available in the main database. In this study, each component is associated with different uncertainties (low, average, and high) (see Section 2.3).
- **Size the components.** Algorithms are used to size the vehicle components to compare vehicles with the same VTS. Once the sizing is complete, all the components' features are known, and thus it is possible to estimate the retail price of the vehicle. The sizing algorithms are specific for each configuration and are discussed below in detail.

- **Run the simulation.** The third step calculates the vehicle energy consumption by simulating the different standard U.S. test procedures.

2.3 TIMEFRAMES AND UNCERTAINTIES

To evaluate the fuel-efficiency benefits of advanced vehicles, each vehicle is designed from the ground up based on each component's assumptions. The fuel efficiency is then simulated using the Urban Dynamometer Driving Schedule (UDDS) and Highway Federal Emissions Test (HWFET). The vehicle costs are calculated from each individual component characteristics (e.g., power, energy, weight). Both cost and fuel efficiency are then used to define the market penetration of each technology to finally estimate the amount of fuel saved. The process is highlighted in Figure 14. This report focuses on the first phase of the project: fuel efficiency and cost.

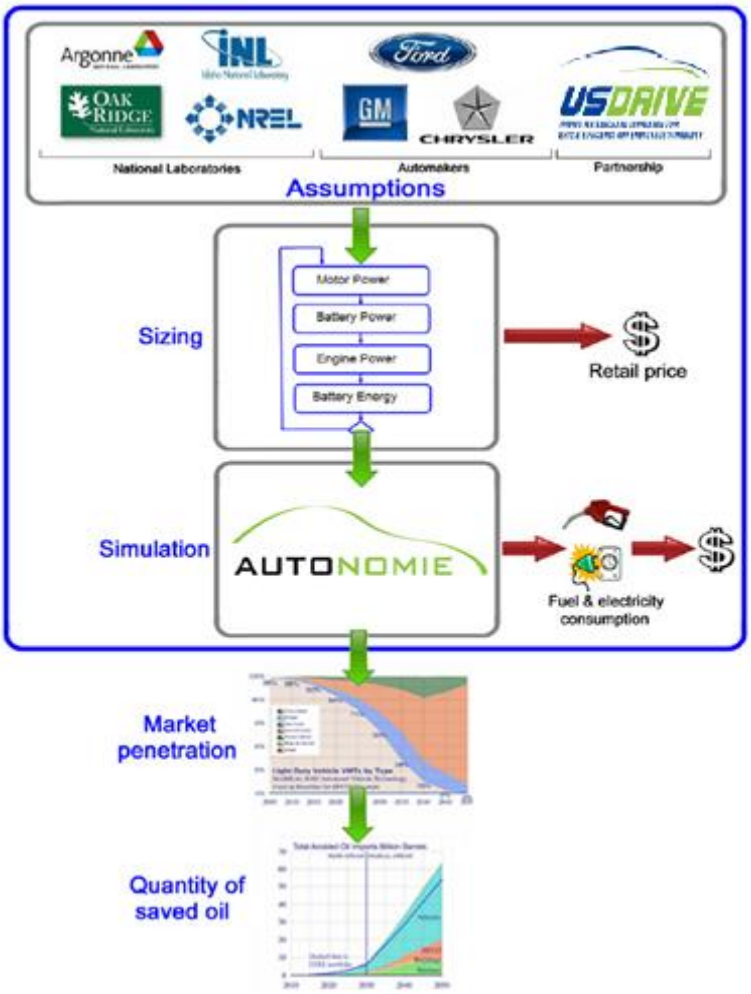


FIGURE 14 Process to evaluate fuel efficiency of advanced vehicle technologies

To properly assess the benefits of future technologies, several options were considered, as shown in Figure 15:

- Five vehicle classes: compact, midsize car, small SUV, medium SUV, and pickup truck.
- Six timeframes: reference (2010), 2015, 2020, 2025, 2030, and 2045. All years are "lab year" with a 5 year delay with production year.
- Five powertrain configurations: conventional, HEV, PHEV, fuel-cell HEV, and BEV.
- Four fuels: gasoline, diesel, ethanol (E85), and compressed natural gas (CNG).
- Three risk levels: low, average, and high. These correspond, respectively, to 10% uncertainty (aligned with original-equipment-manufacturer [OEM] improvements based on regulations), 50% uncertainty, and 90% uncertainty (aligned with aggressive technology advancement based on the DOE VTO). These levels are explained more fully below.

Overall, more than 5,000 vehicles were defined and simulated in Autonomie. The study does not include mild hybrids and does not focus on tailpipe emissions. Micro hybrid technology is introduced starting in 2030 to replace conventional vehicles.

When dealing with uncertainties, numerous methodologies are available. In previous studies, Argonne has compared Monte Carlo simulation with a triangular distribution analysis (Faron et al. 2009). By allowing the introduction of uncertainty into our algorithm inputs, the Monte Carlo method increases the amount of useful information to describe a vehicle's possible behaviors. The major improvement concerns the introduction of the risk notion associated with each result. Rather than providing a single forecast value, Monte Carlo simulation provides the probability of occurrences associated with every possible output value. As a result, forecasts are more fully and accurately described and confidence intervals can be derived for each output.

The results from Monte Carlo simulations based on a midsize PHEV were defined, providing a mode for both fuel economy and cost within a certain confidence interval. The approach was then compared with the existing three-point option. Results demonstrated that, as expected, Monte Carlo simulation provided a narrower range. However, increasing the amount of information available in the results has a computational cost. The experiments carried out so far led us to a first evaluation of the number of points required to simulate. This number varies from 100 to 200, depending on the number of

uncertain inputs considered. While computational time varies for each configuration, the average time required to simulate a PHEV on all these points was 150 min.

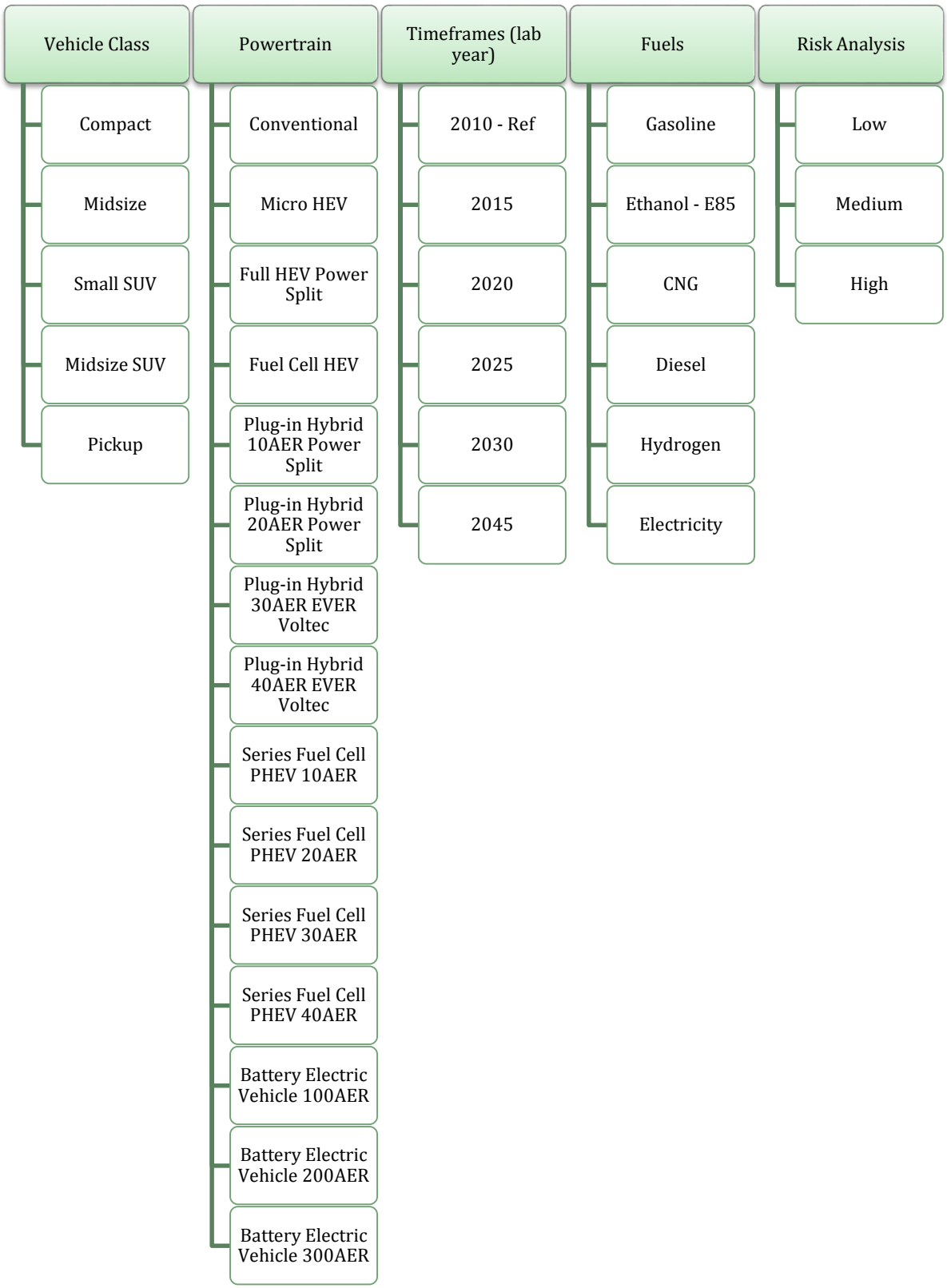


FIGURE 15 Vehicle classes, timeframes, configurations, fuels, and risk levels

Because of the large number of vehicles considered in the study, and the fact that the predictions between the Monte Carlo and the 3 points options are relatively close, the triangular distribution approach (low, average, and high) was employed, as shown in Figure 16. For each component, assumptions were made (i.e., efficiency, power density), and three separate values were defined to represent the (1) 90th percentile, (2) 50th percentile, and (3) 10th percentile. A 90% probability means that the technology has a 90% chance of being available at the time considered. For each vehicle considered, the cost assumptions also follow the triangular uncertainty. Each set of assumptions was, however, used for each vehicle, and the most efficient components were not automatically the cheapest. As a result, for each vehicle considered, we simulated three options for fuel efficiency. Each of these three options also had three values representing the cost uncertainties. A more detailed description of the uncertainty process is available in Henrion (2008).

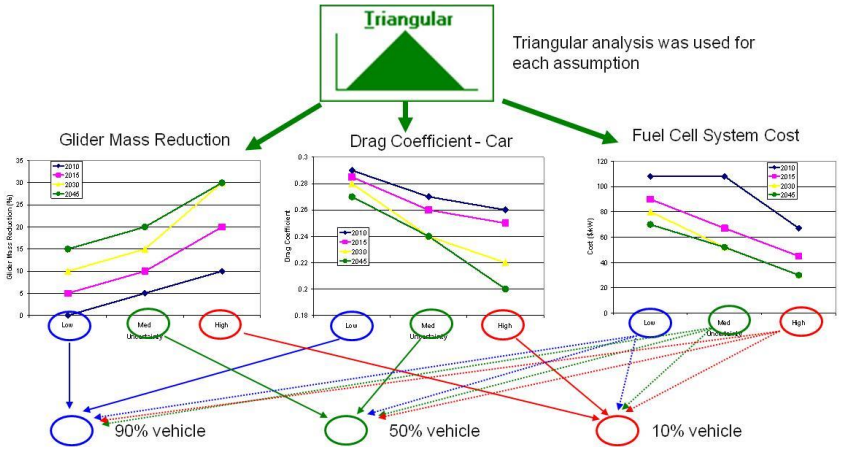


FIGURE 16 Uncertainty process description

The "reference case" used in the study was the low-uncertainty 2010 lab year case (2015 MY production.

2.4 HIGH PERFORMANCE COMPUTING UTILIZATION

With the multitude of technology combinations to simulate, conventional computing resources were no longer practical. Running all of the simulations on one computer would take several months or years before any analysis could be completed. Thanks to advances in distributed computing, simulation time can be greatly reduced. Among the computing resources available at Argonne is a large cluster of 160 worker nodes dedicated to the System Modeling and Control Group. A larger computing facility (MIRA) is being considered in the future to further accelerate the simulations.

Algorithms were developed for optimizing the distribution of jobs for vehicle simulations and parametric studies. This system (Figure 17) was used to run the entire study.

One of the biggest advantages of the distributed computing is that it facilitates the quick repetition of simulations, which occurred many times during this study. This experience allowed Argonne to develop a new process—an ultimate large-scale simulation process—that is functional, smooth, and flexible, with the ability to easily and quickly add and rerun as many vehicles and new technologies as needed. The generic process will be able to automatically handle the additional technologies without any code modification. The distributed computing greatly facilitated the rerunning of simulations, which occurred numerous times during this study.

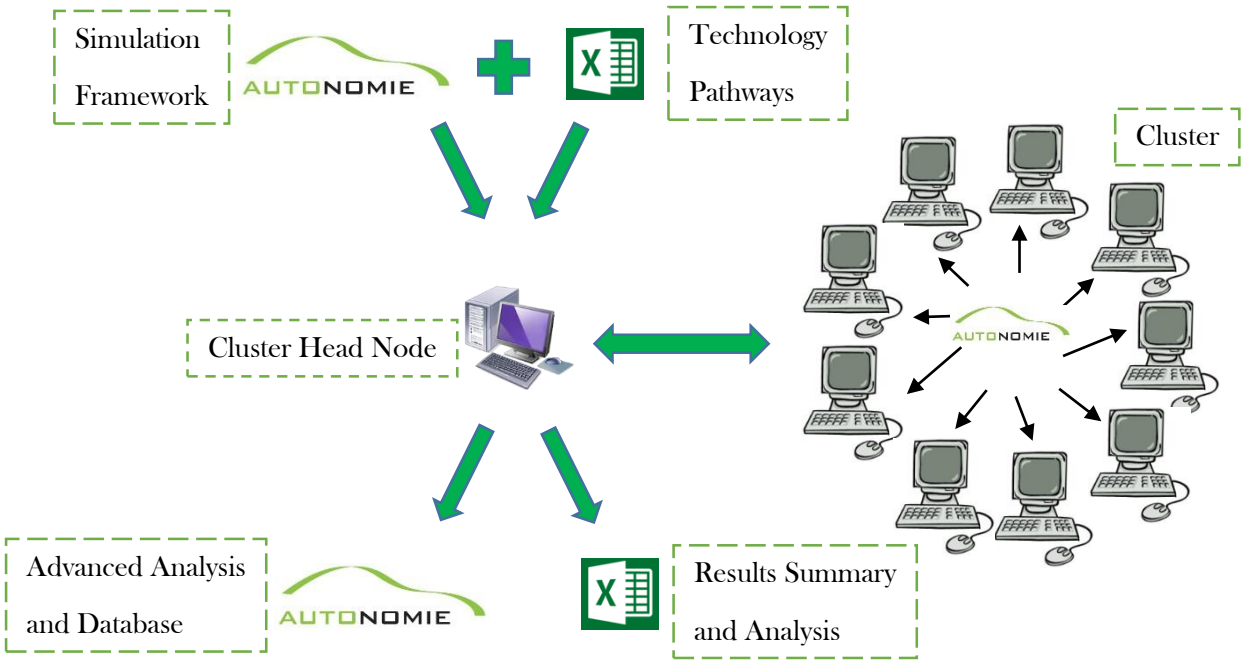


FIGURE 17 Distributed computing process

3 COMPONENT ASSUMPTIONS

The assumptions for each component were developed in collaboration with experts from DOE, national laboratories, industry, and academia. These assumptions represent compromises reached by the authors of the study and should not be attributed to any specific organization.

Several hundred assumptions are required to run a single vehicle simulation. Figures 18 and 19 show a short list of these assumptions for the components and vehicles, respectively. The following sections only provide information regarding a very limited set of assumptions, since most of the assumptions were provided by industry partners and are considered proprietary.

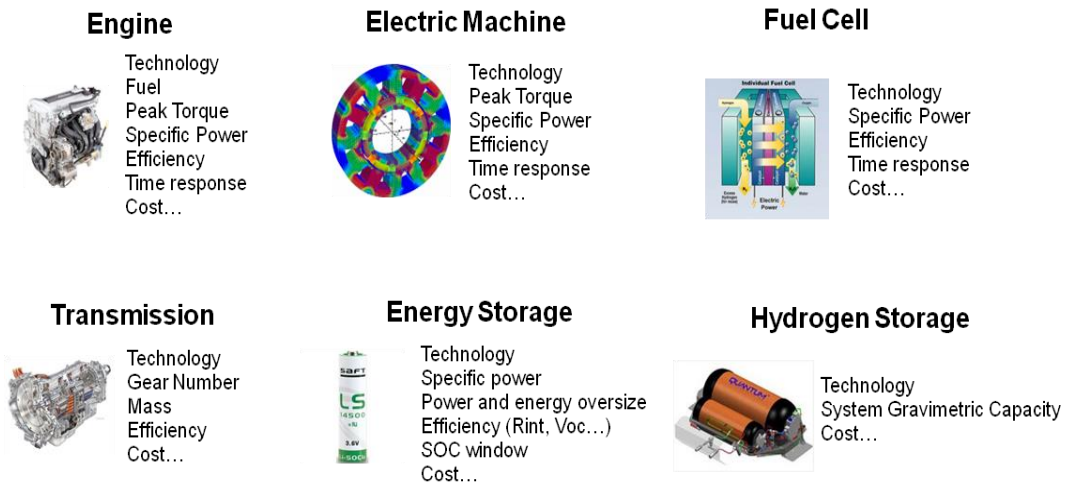


FIGURE 18 Main component assumptions

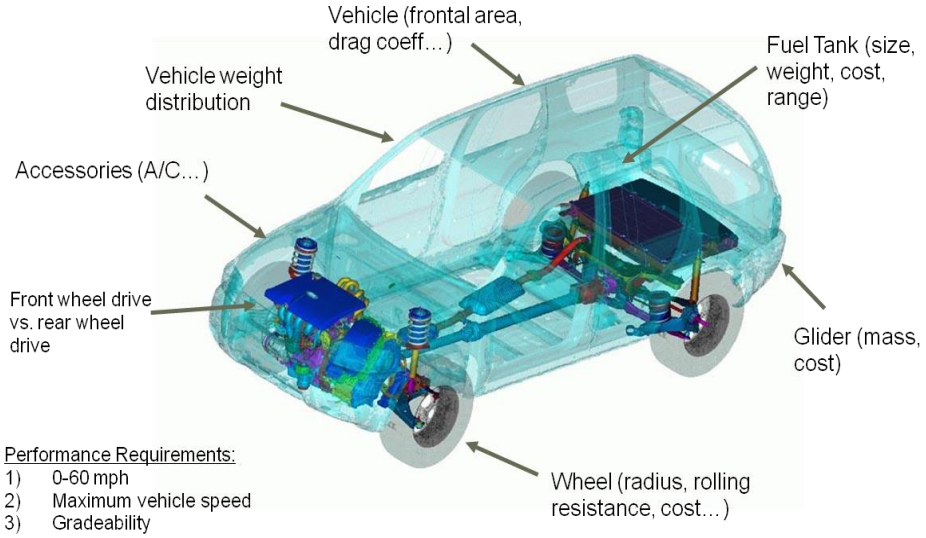


FIGURE 19 Main vehicle assumptions

When available, the high-case assumptions were based on U.S. DRIVE program goals. The other assumptions were developed through discussions with experts from companies, universities, and the national laboratories.

3.1 ENGINE

3.1.1 Reference Engines and Projections

Several state-of-the-art internal combustion engines (ICEs) were selected as the baseline for the fuels considered: gasoline (spark ignition [SI]), diesel (compression ignition [CI]), E85, and CNG. The engines used for HEVs and PHEVs are based on Atkinson cycles, generated from test data collected at Argonne's dynamometer testing facility. Table 1 shows the engines selected as a baseline for the study.

TABLE 1 Definition of the baseline engines used in the present study

Fuel	Source	Displacement (L)	Peak Power (kW)
SI (Conv)	Car manufacturer	2.4	123
CI	Car manufacturer	1.9	110
CNG	Car manufacturer	1.5	111
E85 (Conv)	Car manufacturer	2.2	106
SI/E85 (HEV)	Argonne	1.5	57

A wide range of technologies are available to increase the engine efficiency including:

- Low-friction lubricants
- Reduced engine friction losses
- Cylinder deactivation
- Variable valve timing (VVT) and variable valve lift
- Turbocharging and downsizing
- Variable compression ratio (VCR)
- Stoichiometric and lean-burn gasoline direct injection,…

Based on literature review and discussions with experts, peak efficiencies were developed for each fuel and timeframe (Figure 20 and Table 2)

Among the different ICEs, the CNG and ethanol engines show the most significant efficiency increase, from 36% in the reference case to 52% in the 2045 high case. The other engines show a lower increase in efficiency, since they are already well-developed technologies. The efficiencies of the other ICEs increase from 42% in the reference case to 52% in the 2045 high case for diesel (36% to 50% for

gasoline). Of note is that the difference in peak efficiency between gasoline and diesel is expected to narrow in the future, because of the combination of advanced gasoline engine technologies and the impact of evermore stringent after-treatments for diesel.

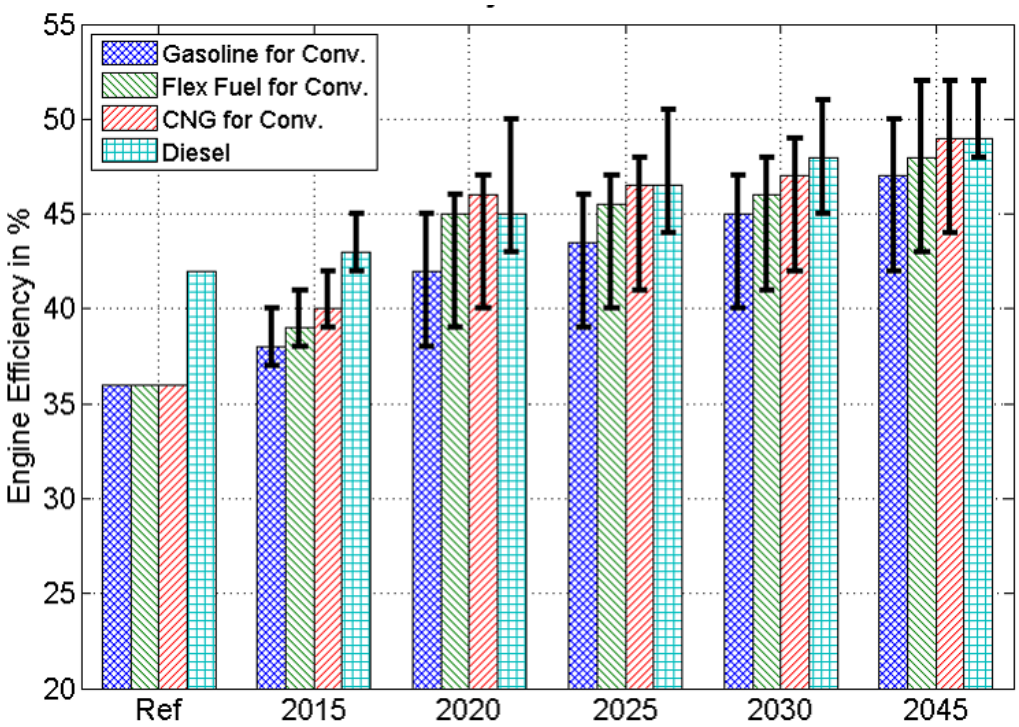


FIGURE 20 ICE efficiency for diesel, CNG, and gasoline fuels for multiple lab year.

TABLE 2 Engine peak efficiencies (top) and Engine efficiency at 2000rpm - 2bar, 20% (bottom)

Parameter	2010 lab	2015 lab			2020 lab			2025 lab			2030 lab			2045 lab		
	Low	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
Gasoline IC Engine peak eff	36%	37%	38%	40%	38%	42%	45%	39%	44%	46%	40%	45%	47%	42%	47%	50%
Diesel IC Engine peak eff	42%	42%	43%	45%	43%	45%	50%	44%	47%	51%	45%	48%	51%	48%	49%	52%
Flex Fuel IC Engine peak eff	36%	38%	39%	41%	39%	45%	46%	40%	46%	47%	41%	46%	48%	43%	48%	52%
CNG IC Engine peak eff	36%	39%	40%	42%	40%	46%	47%	41%	47%	48%	42%	47%	49%	44%	49%	52%

Parameter	2010 lab	2015 lab			2020 lab			2025 lab			2030 lab			2045 lab		
	Low	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
Gasoline Engine eff at 2bar at 2000rpm	24%	23%	24%	25%	25%	27%	29%	27%	29%	31%	29%	31%	32%	30%	32%	34%
Gasoline Engine eff at 20% at 2000rpm	24%	23%	24%	25%	25%	27%	29%	27%	29%	31%	29%	30%	32%	30%	32%	34%
Diesel Engine eff at 2bar at 2000rpm	26%	25%	27%	28%	27%	29%	31%	29%	30%	32%	30%	31%	33%	32%	33%	35%
Diesel Engine eff at 20% at 2000rpm	30%	31%	32%	33%	33%	34%	36%	33%	35%	38%	33%	35%	39%	34%	35%	40%

3.1.2 Determination of Number of Cylinders

To properly calculate engine cost, it is necessary to define its number of cylinders are needed for a given power level.

Figure 21 shows the relationship between the number of cylinders in a gasoline engine and its peak power. This figure is based literature review. On the basis of Figure 21, 4-cylinder engines were used up to a power level of 140 kW, 6-cylinder engines for power between 140 and 220 kW, and 8-cylinder engines for power above 220 kW.

The same approach was taken for diesel engines, as shown in Figure 22. The small number of diesel engines in the U.S. database does not provide as clear a distribution as the gasoline case, but from the distribution shown in Figure 22, the same thresholds were used. For ethanol engines, we used the same cylinder/engine-power equation as the gasoline and diesel engines.

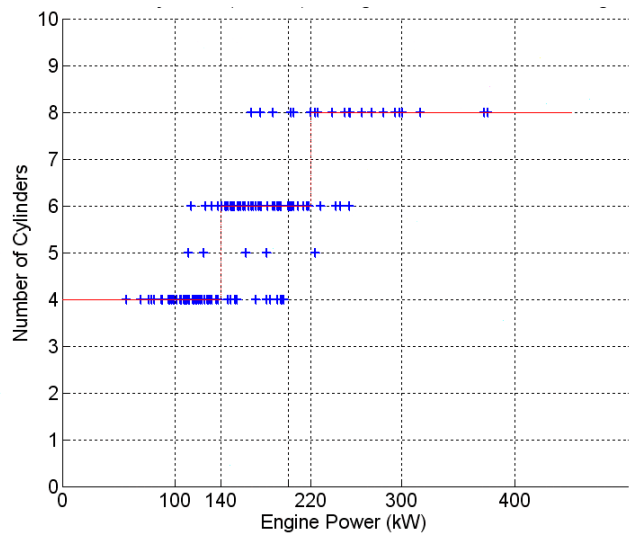


FIGURE 21 Number of cylinders versus engine power for database gasoline engines (blue = values from the database; red = thresholds chosen for the study)

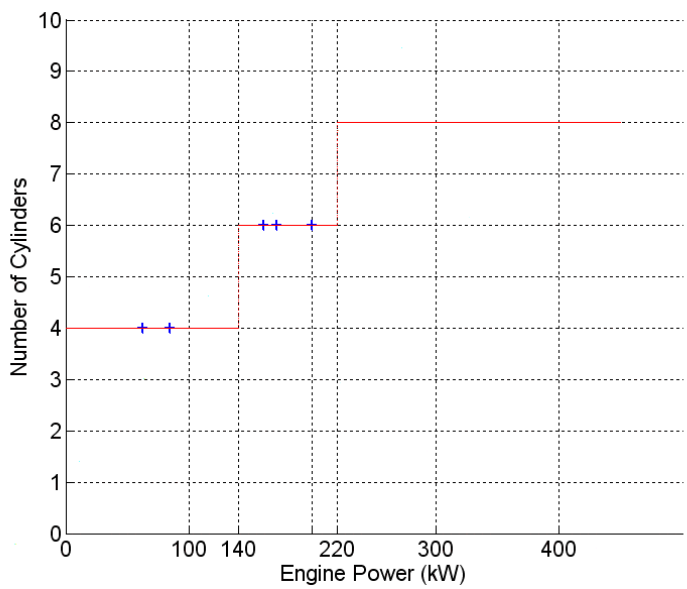


FIGURE 22 Number of cylinders versus engine power for database diesel engines (blue = values from the database; red = thresholds chosen for the study)

3.2 FUEL-CELL SYSTEM

Fuel-cell vehicles are undergoing extensive R&D because of their potential for high efficiency and low emissions (zero-emission). Multiple companies have recently announced production vehicles.

Figure 23 shows the specific power and specific energy of the fuel-cell system. Between the reference case and 2045, the specific power increases from 659 W/kg to up to 870 W/kg, or an increase ranging from 1.5% to 32% (Table 3). It should be noted that in the case of the fuel-cell systems, all the assumptions were provided by DOE and National Laboratories.

The fuel-cell system model used for the study was based on a steady-state look-up table. The fuel cell system map (5x mass activity) was provided by the Argonne Fuel Cell Group using GCTool. As a result, the additional losses from the balance of plant due to transient operating conditions were not taken into account.

The fuel cell system simulated has been sized to range 320 miles on the adjusted combined cycle.

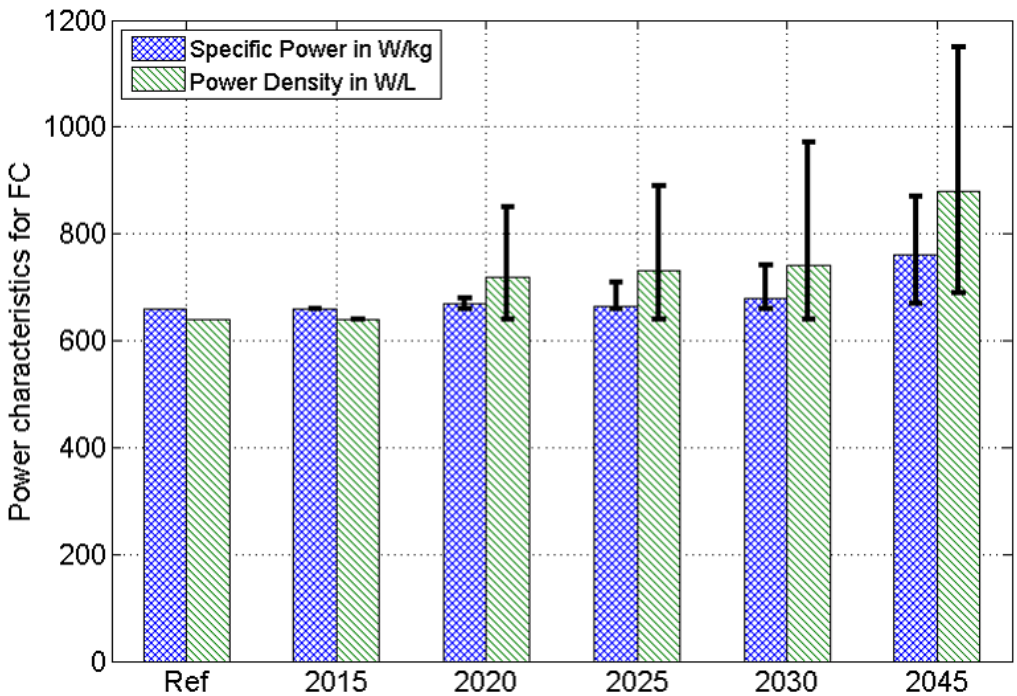


FIGURE 23 Specific power and power density for fuel cell systems

TABLE 3 Fuel-cell system power and efficiency assumptions

Parameter	2010 lab	2015 lab			2020 lab			2025 lab			2030 lab			2045 lab		
	Low	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
Specific Power FC system (W/kg)	659	659	659	659	659	670	680	659	665	710	659	680	740	670	760	870
Peak Fuel Cell System Efficiency at 25% Rated Power	59%	59%	59%	60%	63%	65%	66%	64%	66%	67%	65%	67%	68%	68%	69%	70%

Figure 24 shows the evolution of the fuel-cell system peak efficiencies. The peak fuel-cell efficiency was assumed to be at 59% for the reference year and it will increase up to 70% by 2045.

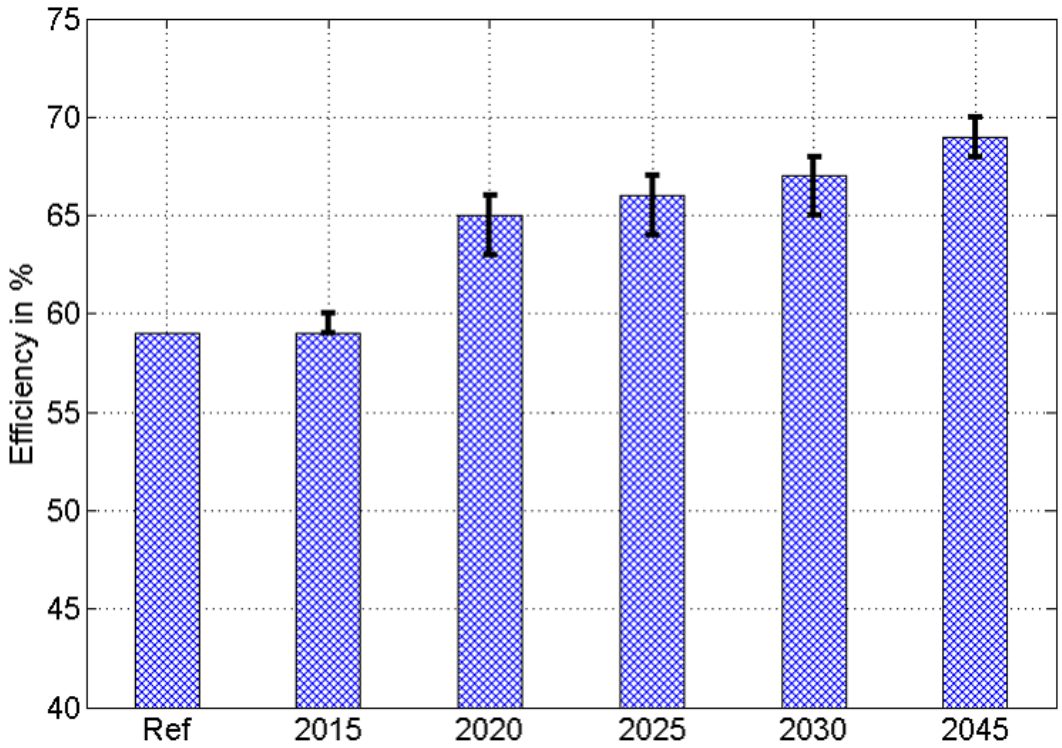


FIGURE 24 Fuel-cell system efficiency

3.3 ELECTRIC MACHINE

Two different electric machines were used as references in this study:

- Power-split vehicles operate with a permanent-magnet electric machine (similar to that used in the Toyota Camry).
- Series configurations (fuel cell) and EVs use an induction primary electric machine.

The reference electric-machine data were provided by car companies, suppliers, and Oak Ridge National Laboratory.

As shown in Figure 25 and Table 4, the power-electronic specific power will significantly increase between 2010 (reference) and 2045. Both electric machines used in the study have a reference peak efficiency of 90%. As shown in Figure 26, it will increase from 90% to up to 97% between 2010 and 2045. Those efficiencies numbers exclude boost converter efficiency.

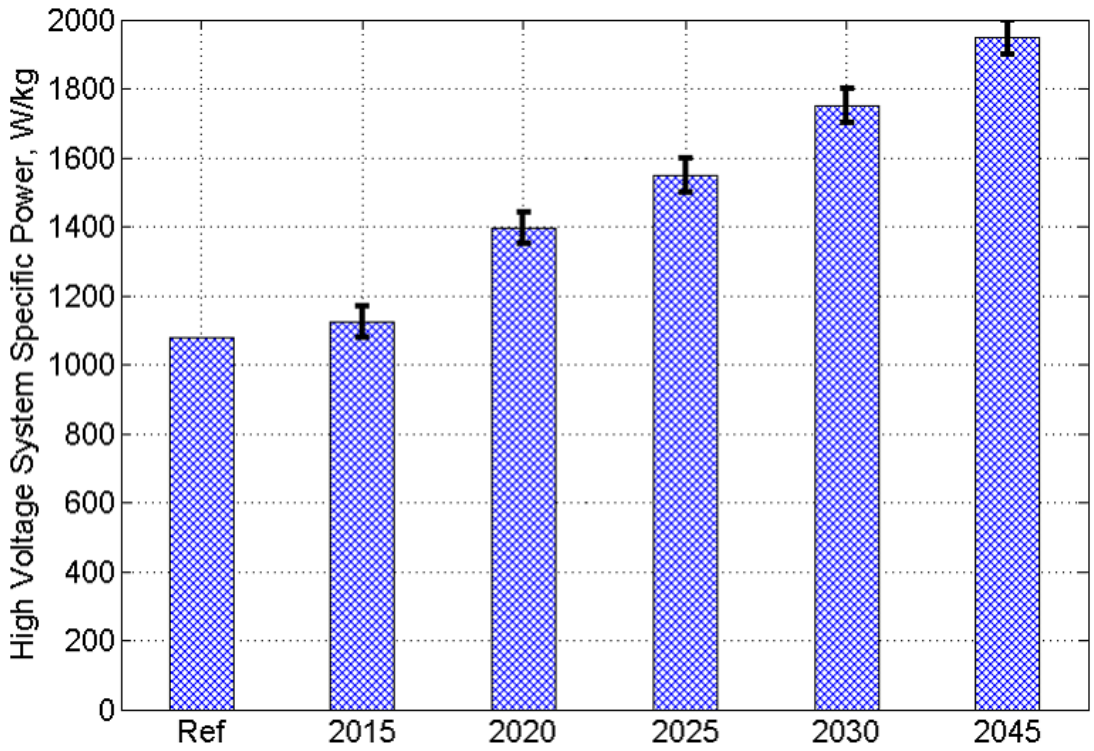


FIGURE 25 Electric-machine specific power

TABLE 4 Electric machine assumptions

Parameter	2010 lab	2015 lab			2020 lab			2025 lab			2030 lab			2045 lab		
	Low	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
High Voltage System Specific Power (without boost*) - W/kg	1080	1080	1125	1170	1350	1395	1440	1500	1550	1600	1700	1750	1800	1900	1950	2000
High Voltage System Peak Efficiency (w/o boost)	90%	91%	92%	93%	92%	93%	94%	93%	94%	95%	94%	95%	96%	95%	96%	97%

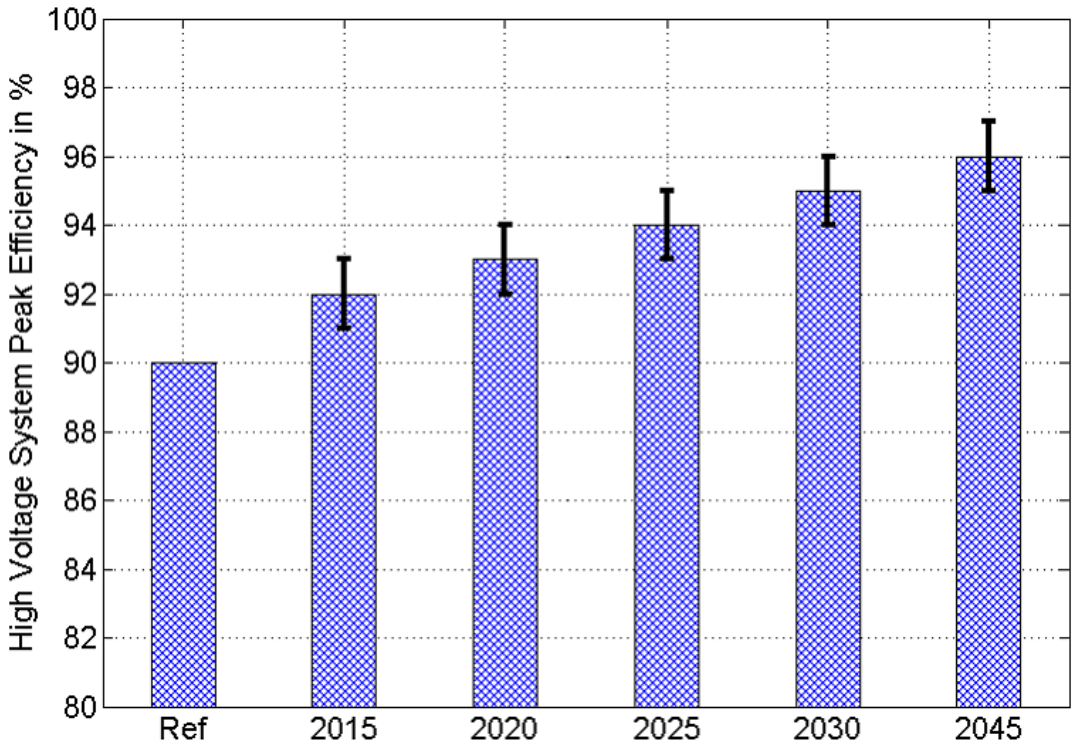


FIGURE 26 Electric-machine peak efficiency

3.4 ENERGY STORAGE SYSTEM

Only batteries were used in the present study, on the assumption that ultra-capacitors alone could not provide sufficient available energy for HEV applications. We also considered that coupling ultra-capacitors with batteries would be cost-prohibitive and that Li-ion battery life would be significantly improved in the short term, making the combination ineffective.

The battery performance data used in the study were provided by Argonne, Idaho National Laboratory, and major battery suppliers. A scaling algorithm developed by Argonne was used for the high-energy cases (Nelson et al. 2007).

The battery used for the HEV reference case was a NiMH battery. It was assumed that this technology is the most likely to be used until MY 2015. Thus, we simulated the HEVs with this battery for the reference case (2010 lab). The model used was similar to the one found in the Toyota Prius. For PHEV applications, all the vehicles were run with a Li-ion battery performance data provided by Argonne. Table 5 provides a summary of the battery characteristics. For HEVs, the reference (2010) case used NiMH batteries, and the 2015–2045 cases used Li-ion batteries.

TABLE 5 Description of reference battery characteristics

Type	Information Source	Technology	Reference Cell Capacity (Ah)
HEV	Idaho National Laboratory Battery manufacturers	NiMH Li-ion	6.5 6
PHEV	Argonne	Li-ion	41

After a long period of time, batteries lose some of their power and energy capacity. To be able to maintain the same performance at the end-of-life (EOL) compared with the beginning-of-life, an oversize factor is applied while sizing the batteries for power (HEVs) and energy (PHEVs and BEV 100AER). These factors are designed to represent the percentage of power and energy that will not be provided by the battery at the EOL compared with the initial power and energy given by the manufacturer. The oversize factor is decreased over time to reflect an improvement in the ability of batteries to uniformly deliver the same performance throughout their life cycles. Figure 27 shows that the reference vehicles are sized with a 20% power oversize factor for all HEVs and energy oversize factors of 30% for PHEVs. In 2045, these values will be reduced to 10% to 14% for power oversize, and 20% to 30% for PHEV energy oversize. These oversizing factors influence the cost and weight; however, all the simulations are run at EOL (i.e., the additional weight is taken into account, but the power and energy used for the simulation are EOL values). BEVs 200AER and 300AER are not oversized.

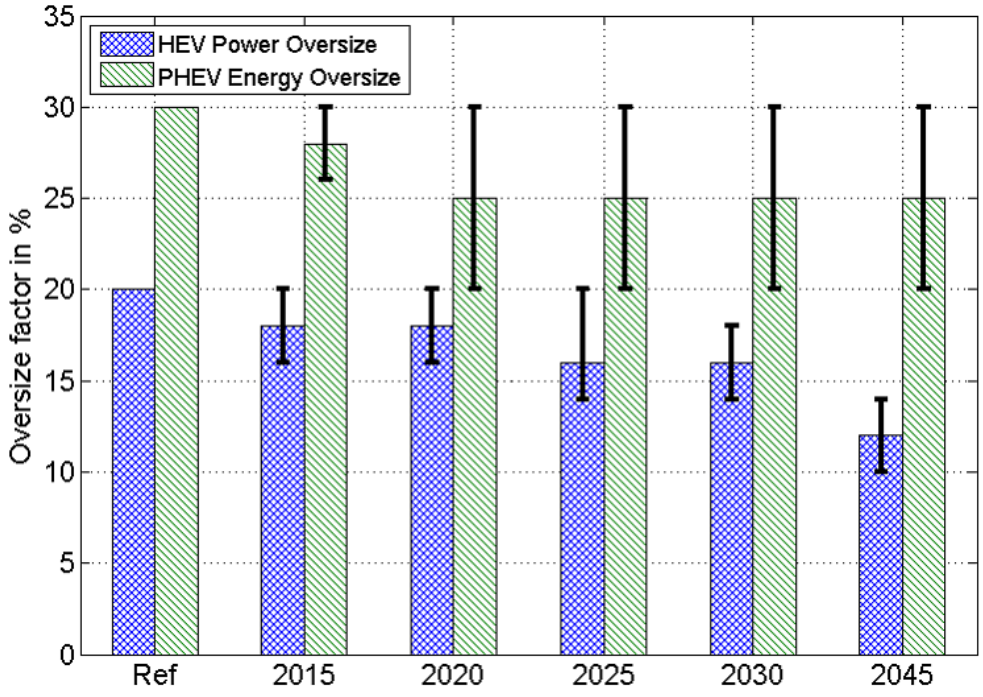


FIGURE 27 Battery power and energy oversize for HEVs and PHEVs

Figures 28 and 29 show the relationship between the power/energy ratio and the battery energy cost.

Figure 30 shows that the SOC values used for PHEVs were 30% for the minimum and 90% for the maximum in the reference case. It also shows that they change slightly over time to reach 20% for the minimum and 95% for the maximum in the 2045 high case.

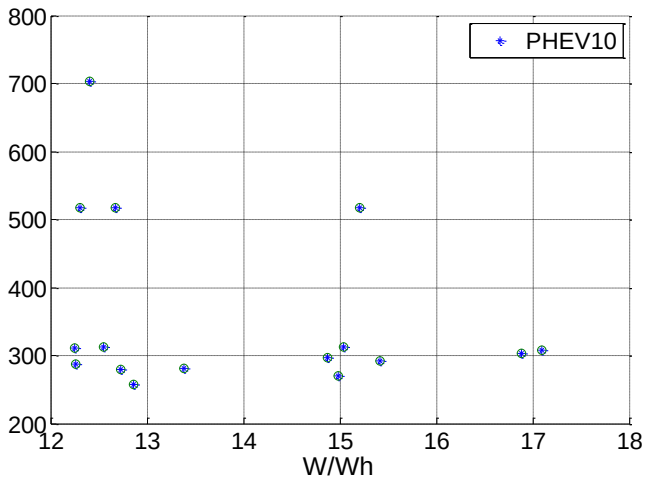


FIGURE 28 Relationship between power/energy ratio and battery energy cost 2010 – 2045 (lab year) – PHEV10

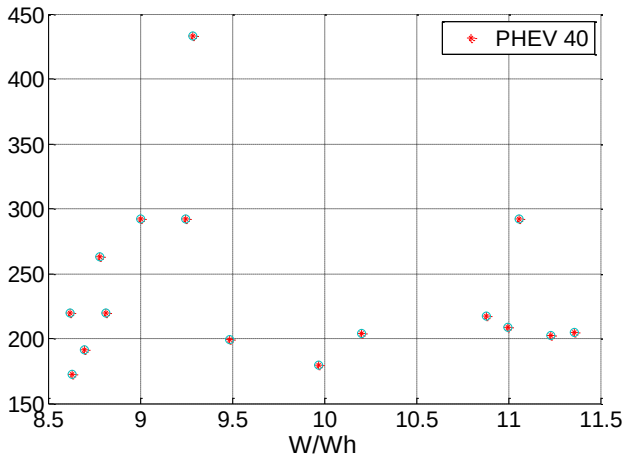


FIGURE 29 Relationship between power/energy ratio and battery energy cost 2010 – 2045 (lab year) – PHEV40

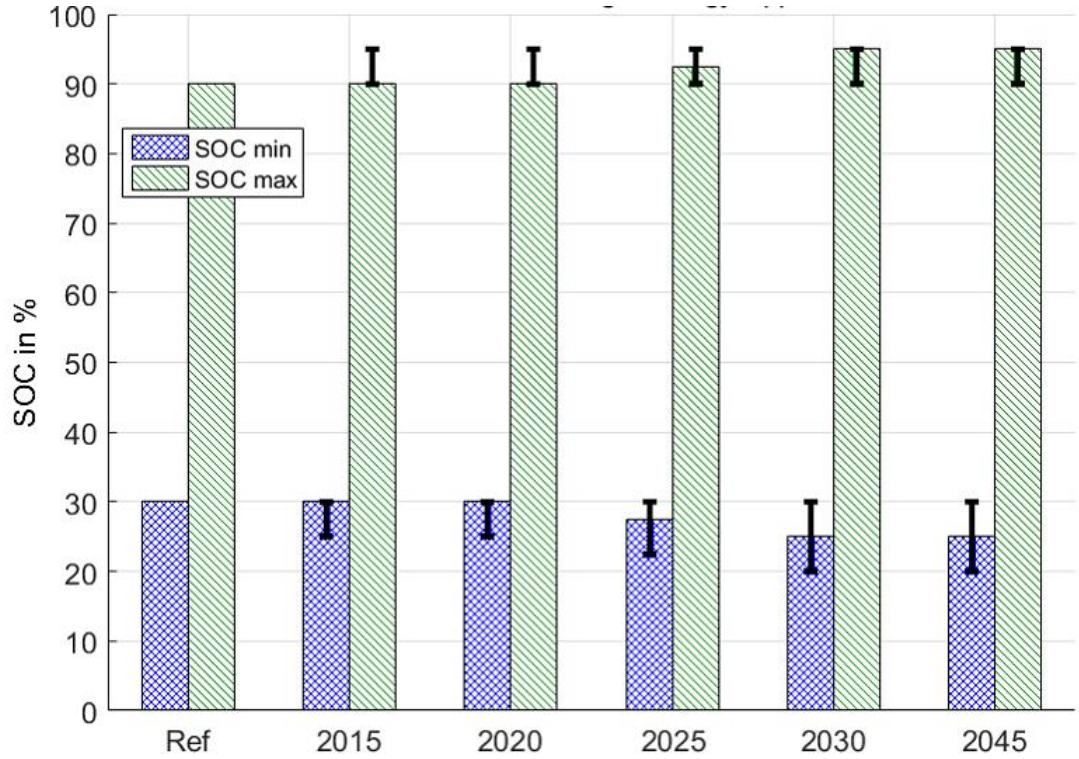


FIGURE 30 Battery SOC for PHEVs

Figure 31 shows that the SOC values used for 100AER BEVs were 14% for the minimum and 95% for the maximum in the reference case and remain the same until 2045. For 200AER and 300AER BEV applications (also shown in Figure 31), the minimum SOC is lowered to 4% all throughout the years. The battery assumptions are summarized in Table 6.

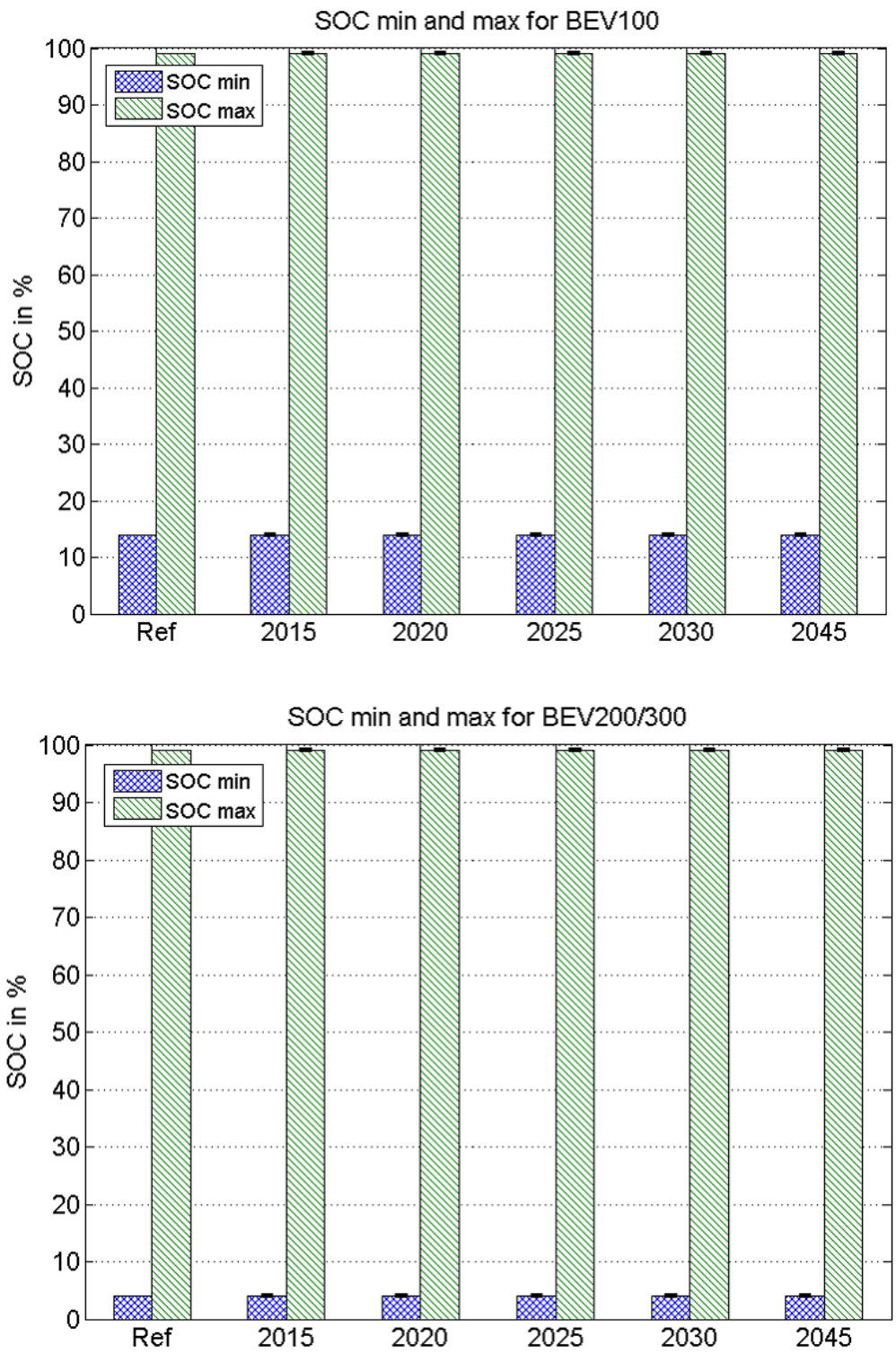


FIGURE 31 Battery SOC for 100AER BEVs (top) and 200AER and 300AER BEVs (bottom)

TABLE 6 Battery assumptions (%)

Parameter	2010 lab - Low	2015 lab			2020 lab			2025 lab			2030 lab			2045 lab		
		Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
Power oversize	20	20	18	16	20	18	16	20	16	14	18	16	14	14	12	10
Energy oversize	30	30	28	26	30	25	20	30	25	20	30	25	20	30	25	20
SOC max – PHEV10	90	90	90	95	90	90	95	90	93	95	90	95	95	90	95	95
SOC min – PHEV10	30	30	30	25	30	30	25	30	28	23	30	25	20	30	25	20
SOC max – PHEV40	90	90	90	95	90	90	95	90	93	95	90	95	95	90	95	95
SOC min – PHEV40	30	30	30	25	30	30	25	30	28	23	30	25	20	30	20	20
SOC max – BEV	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
SOC min – BEV 100	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
SOC min – BEV 200,300	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

3.5 DRIVELINE

Several types of transmission technologies were considered in this study:

- **Increased number of gears for automatic transmissions.** Additional gears allow the engine to be operated closer to its best efficiency. While they are now limited to high-end vehicles, high-gear-count transmissions (i.e., up to eight gears) are expected to be used in a larger number of vehicles in the near future.

- **Dual-clutch transmission (DCT).** Every car manufacturer is working on developing this technology, and some already have DCT models in production. DCTs combine the advantages of automatic transmissions (drive quality—no torque interruption) and manual transmissions (efficiency—no torque converter).

Because of drive-quality requirements in America, automated manual transmissions were not included in this study.

Conventional vehicles were simulated with an automatic transmission, since that option best represents the American car market. However, a midsize car with a DCT was simulated for a few timeframes.

Power-split HEVs and PHEVs both have a planetary gear set with 78 ring teeth and 30 sun teeth. Finally, the fuel-cell vehicles and EVs use a two-speed manual transmission to increase the powertrain efficiency as well as allow them to achieve a maximum vehicle speed of at least 100 mph. Tables 7 through 10 give the characteristics of all transmissions used in the study.

The efficiencies of the transmission types, other than automatic, and of the final drive ratio, are already high and are expected to slightly increase over time, as shown in Figure 32.

The shifting algorithm automatically defined the shifting strategy based on the powertrain ratios and the component efficiencies to minimize fuel consumption while maintaining acceptable drive quality (i.e., torque reserve). The algorithm has been validated using APRF test data with several conventional vehicles over the past 10 years (Moawad and Rousseau 2012; Moawad et al. 2015)

TABLE 7 Transmission technologies modeled for different vehicle classes(*)

Parameter	2010	2015			2020			2025			2030			2045		
	Low	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
Peak Efficiency (%)																
Automatic Trans	97.0	97.0	98.0	98.5	97.5	98.0	98.5	97.5	98.0	98.5	97.5	98.0	98.5	97.5	98.0	98.5
DCT	98.5	98.5	98.5	99.0	98.5	98.5	99.0	98.5	98.5	99.0	98.5	98.5	99.0	98.5	98.5	99.0
Planetary gearset	98.0	98.0	98.5	99.0	98.0	98.5	99.0	98.0	98.5	99.0	98.0	98.5	99.0	98.0	98.5	99.0
Final Drive Peak Efficiency (%)	98.0	98.0	98.0	98.5	98.0	98.0	98.5	98.0	98.0	98.5	98.0	98.0	98.5	98.0	98.0	98.5
Conventional Vehicle																
gb_Compact	MCOM6	MCOM6	MCOM6	MCOM6	MCOM6	MCOM6D	MCOM8D	MCOM6	MCOM6D	MCOM8D	MCOM6D	MCOM8D	MCOM8D	MCOM6D	MCOM8D	MCOM8D
gb_Midsize	MCAR6	MCAR6	MCAR6	MCAR6D	MCAR6	MCAR8	MCAR8D	MCAR6	MCAR8	MCAR8D	MCAR8	MCAR8	MCAR8D	MCAR8	MCAR8D	MCAR8D
gb_Small_SUV	SSUV6	SSUV6	SSUV6	SSUV6D	SSUV6	SSUV6D	SSUV8D	SSUV6	SSUV6D	SSUV8D	SSUV6D	SSUV6D	SSUV8D	SSUV6D	SSUV8D	SSUV8D
gb_Midsize_SUV	MUSV6	MSUV6	MSUV6	MSUV6	MSUV6	MSUV6	MSUV7	MSUV6	MSUV6	MSUV7	MSUV6	MSUV7	MSUV8	MSUV7	MSUV8	MSUV8
gb_Pickup	PICKUP6	PICKUP6	PICKUP6	PICKUP6	PICKUP6	PICKUP6	PICKUP8	PICKUP6	PICKUP6	PICKUP8	PICKUP6	PICKUP8	PICKUP8	PICKUP8	PICKUP8	PICKUP8

(*) The code names of the transmissions are based on the vehicle class (i.e., COM for compact, MCAR for midsize car) and the number of gears. For example, SSUV6 means a small SUV with a six-gear transmission.

TABLE 8 Gear ratios, final drive ratios for all transmissions

	Name	Type									
Compact car	MCOM5	AU	Gear Ratios	3.67	2.14	1.45	1.03	0.81			
			Final Drive	3.08							
	MCOM6	AU	Gear Ratios	4.45	2.91	1.89	1.44	1	0.74		
			Final Drive	3.47							
	MCOM6D	DCT	Gear Ratios	4.67	2.96	1.93	1.34	0.97	0.74		
			Final Drive	3.47							
	MCOM8D	DCT	Gear Ratios	4.82	3.01	1.95	1.54	1.19	0.92	0.78	0.62
			Final Drive	3.5							
Midsize CAR	MCAR5	AU	Gear Ratios	2.65	1.52	1.04	0.74	0.54			
			Final Drive	4.44							
	MCAR6	AU	Gear Ratios	4.58	2.91	1.91	1.44	1	0.74		
			Final Drive	3.2							
	MCAR6D	DCT	Gear Ratios	4.81	3.00	1.97	1.35	0.98	0.74		
			Final Drive	3.2							
	MCAR8	AU	Gear Ratios	4.71	3.14	2.1	1.67	1.29	1	0.84	0.67
			Final Drive	3.06							
	MCAR8D	DCT	Gear Ratios	4.95	3.30	2.30	1.66	1.25	0.97	0.79	0.67
			Final Drive	3.06							
Small SUV	SSUV5	AU	Gear Ratios	4.24	2.36	1.52	1.05	0.76			
			Final Drive	3.43							
	SSUV6	AU	Gear Ratios	4.58	2.96	1.91	1.44	1	0.75		
			Final Drive	3.51							
	SSUV6D	DCT	Gear Ratios	4.81	3.07	2.03	1.40	1.01	0.75		
			Final Drive	3.51							
	SSUV8D	DCT	Gear Ratios	4.82	3.01	1.95	1.54	1.19	0.92	0.78	0.62
			Final Drive	3.50							
Midsize SUV	MSUV5	AU	Gear Ratios	3.22	2.32	1.55	1	0.71			
			Final Drive	3.25							
	MSUV6	AU	Gear Ratios	4.15	2.34	1.52	1.14	0.86	0.69		
			Final Drive	2.52							
	MSUV7	AU	Gear Ratios	4.92	3.19	2.04	1.41	1	0.862	0.771	
			Final Drive	3.35							
	MSUV8	AU	Gear Ratios	4.71	3.14	2.1	1.66	1.28	1	0.83	0.66
			Final Drive	3.72							
Pickup Truck	45RFE	AU	Gear Ratios	3	1.67	1	0.75				
			Final Drive	3.55							
	PICKUP5	AU	Gear Ratios	3.52	2.042	1.4	1	0.716			
			Final Drive	3.9							
	PICKUP6	AU	Gear Ratios	4.17	2.34	1.52	1.14	0.86	0.69		
			Final Drive	2.17							
	PICKUP8	AU	Gear Ratios	4.696	3.13	2.104	1.667	1.285	1	0.839	0.667
			Final Drive	2.81							

TABLE 9 Power-split transmission characteristics for all vehicle classes

Characteristic	Value
Gear ratios	30 teeth on the sun gear 78 teeth on the ring gear
Final drive ratio	4.059

TABLE 10 Fuel-cell and EDV transmission characteristics for all vehicle classes

Characteristic	Value
Gear ratios	1.86/1
Final drive ratio	4.44

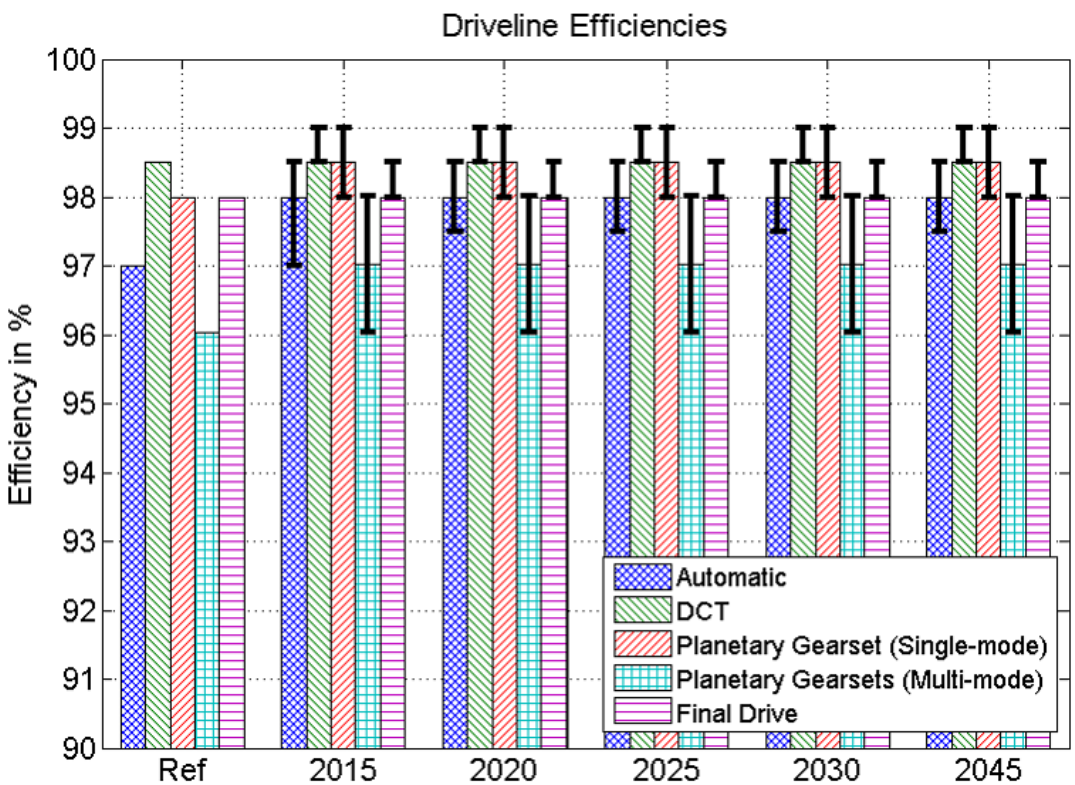


FIGURE 32 Transmission peak efficiencies

3.6 BODY AND VEHICLE

3.6.1 Technology Overview

One of the main factors affecting energy consumption is vehicle weight. Lowering the weight ("lightweighting") reduces the forces required to follow the vehicle speed trace. As a result, the components can be downsized, resulting in smaller components and lower energy consumption. However, the impact of lightweighting is not the same across the powertrain configurations. Studies show that the technology has greater influence in conventional vehicles than their EDV counterparts (Pagerit et al. 2006).

The principal methodologies include material substitution (i.e., high-strength low-alloy steel, aluminum, magnesium, etc.), improved packaging (i.e., ratio of interior volume to exterior size and weight), and unit body construction (i.e., elimination of conventional chassis/body structure). Several studies have shown the potential to decrease the weight by as much as 20% without cost penalties, which highlights the great potential of the technology (USCAR 2010).

Reductions in rolling resistance, frontal area, and drag coefficient also have the potential to significantly improve energy consumption as they also lead to a reduction in the force required at the wheel. This study assumed that the frontal area will increase rather than decrease because American consumers have demanded vehicles with greater passenger and cargo volume (i.e., more room inside the vehicle).

Table 11 gives the main characteristics used as a reference (2010 lab year).

TABLE 11 Reference characteristics across vehicle classes

Vehicle Class	Glider Mass (kg)	Frontal Area (m^2)	Tire	Wheel Radius (m)	Cd
Compact	820	2.33	P195/65/R15	0.32	0.323
Midsize	1,000	2.37	P195/65/R15	0.31	0.311
Small SUV	1,150	2.84	P225/75/R15	0.35	0.356
Midsize SUV	1,260	2.93	P235/70/R16	0.36	0.366
Pickup	1,500	3.27	P255/65/R17	0.45	0.45

3.6.2 Lightweighting

The glider mass was reduced by up to 45% in the 2045 high case (Figure 33 and Table 12) relative to the reference case. The reduction was due to the use of different materials and technologies, such as aluminum. Note that the weight reduction of the glider has been separated into three sections: body, chassis, and rest. First, the glider weight in this study was considered as the vehicle weight minus the powertrain components; that is, the engine, after-treatment, electric machines, fuel cell, fuel storage, energy storage system, transmission, final drive, wheels, and accessories. A fixed percentage of the glider weight was then used for each section. It was assumed that 55% of the glider is due to its body weight, 30% to its chassis weight, and 15% to other components (e.g., seats).

The glider cost changes are due to the technologies used to achieve the glider mass reduction (Figure 34 and Table 13). For a midsize car, the reference-case glider has a manufacturing cost of $9,955 and is steel unibody.

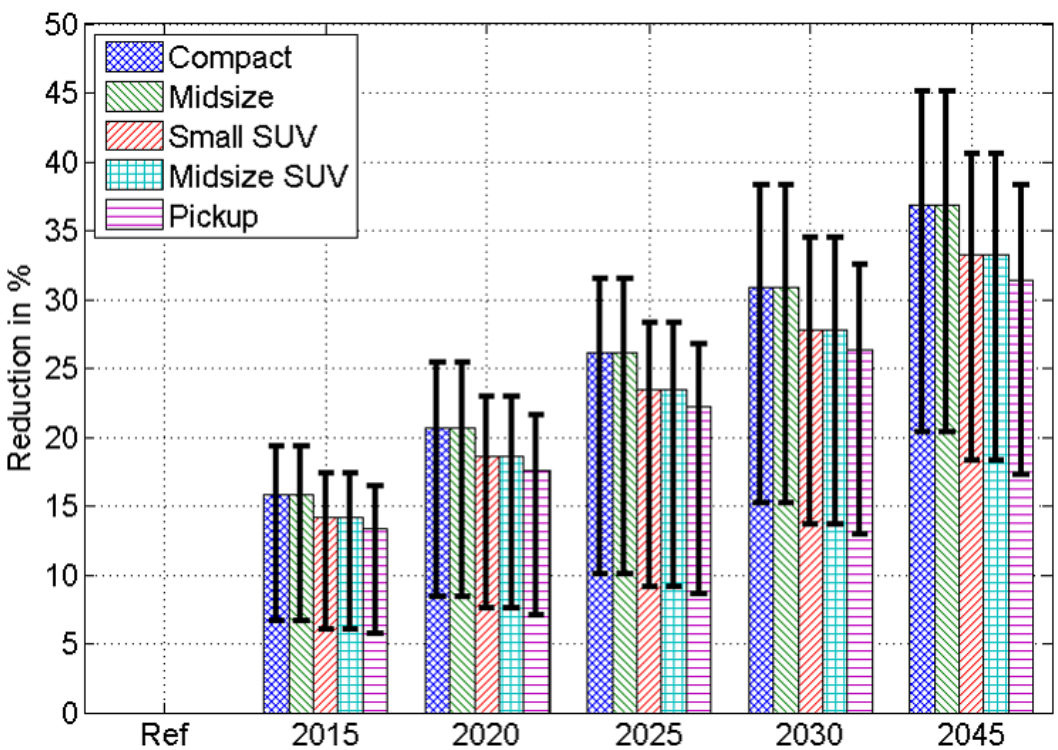


FIGURE 33 Glider mass reduction for all vehicle classes

TABLE 12 Glider weight reduction (%)

Parameter	2010, Low	2015			2020			2025			2030			2045		
		Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
Compact	0	7	16	19	8	21	25	10	26	31	15	31	38	20	37	45
Midsize	0	7	16	19	8	21	25	10	26	31	15	31	38	20	37	45
Small SUV	0	6	14	17	8	19	23	9	24	28	14	28	34	18	33	41
Midsize SUV	0	6	14	17	8	19	23	9	24	28	14	28	34	18	33	41
Pickup	0	6	13	16	7	18	22	9	22	27	13	26	33	17	31	38

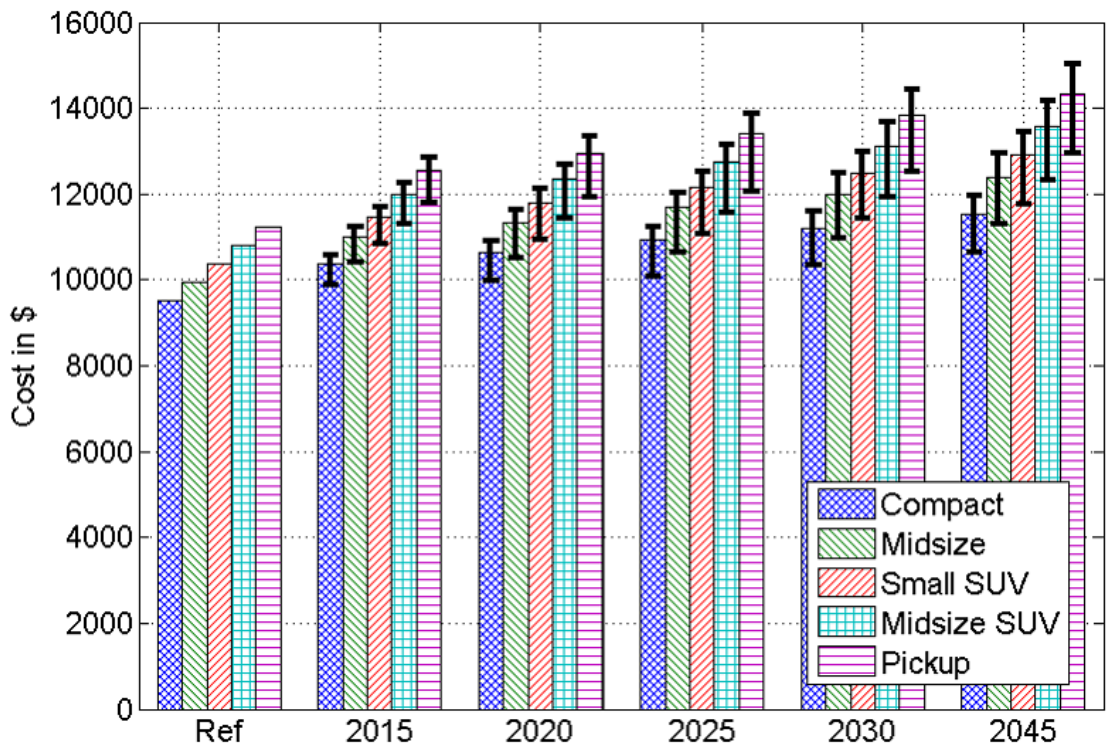


FIGURE 34 Glider costs for the five vehicle classes

TABLE 13 Glider cost ($)

Parameter	2010, Low	2015			2020			2025			2030			2045		
		Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
Compact	9,533	9,895	10,387	10,578	9,988	10,652	10,907	10,081	10,947	11,237	10,358	11,207	11,605	10,634	11,530	11,974
Midsize	9,955	10,396	10,996	11,229	10,509	11,319	11,631	10,623	11,679	12,033	10,961	11,996	12,482	11,298	12,390	12,932
Small SUV	10,378	10,834	11,456	11,696	10,952	11,790	12,112	11,069	12,162	12,528	11,419	12,491	12,994	11,768	12,899	13,459
Midsize SUV	10,800	11,300	11,981	12,244	11,429	12,347	12,700	11,557	12,755	13,156	11,940	13,115	13,666	12,323	13,562	14,175
Pickup	11,222	11,784	12,550	12,846	11,929	12,961	13,359	12,074	13,420	13,871	12,504	13,825	14,444	12,934	14,327	15,017

3.6.3 Drag Coefficient and Rolling Resistance

The same frontal-area increase factor was applied to all vehicle classes (Figure 35 and Table 14). The frontal area is projected to increase up to 10% in the 2045 low case relative to the reference case. The rate of change is not the same between classes.

As shown in Figure 36 and Table 15, the drag coefficient and rolling resistance show similar evolutions across vehicle classes.

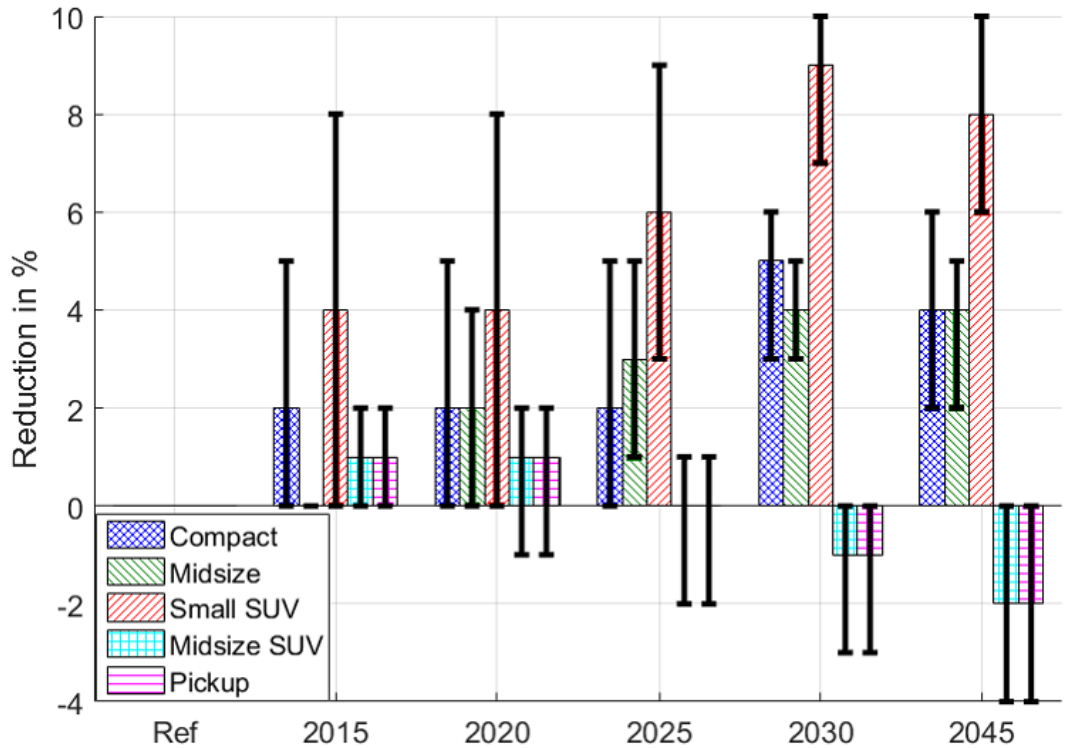


FIGURE 35 Frontal-area percentage reduction over reference case for all vehicle classes

TABLE 14 Rolling resistance assumptions

Parameter	2010, Low	2015			2020			2025			2030			2045		
		Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
Compact	0.008	0.008	0.008	0.007	0.008	0.008	0.007	0.008	0.008	0.007	0.008	0.007	0.006	0.007	0.007	0.006
Midsize	0.008	0.008	0.008	0.007	0.008	0.008	0.007	0.008	0.008	0.007	0.008	0.007	0.006	0.007	0.007	0.006
Small SUV	0.008	0.008	0.008	0.008	0.008	0.008	0.007	0.008	0.008	0.007	0.008	0.007	0.006	0.008	0.007	0.006
Midsize SUV	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.007	0.008	0.007	0.007
Pickup	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008

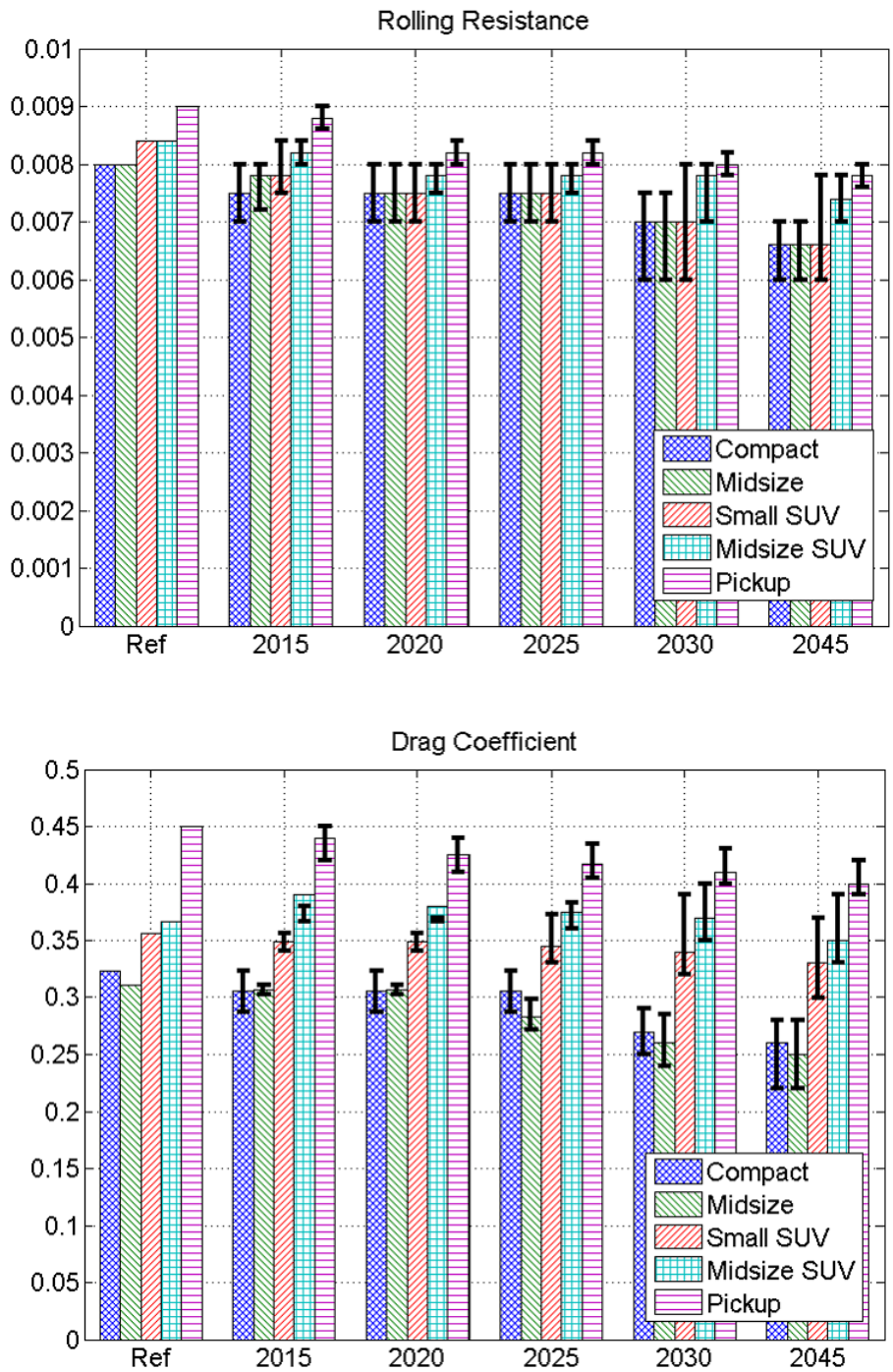


FIGURE 36 Rolling resistance (top) and drag coefficient (bottom) values for the five vehicle classes

TABLE 15 Drag coefficient assumptions

Parameter	2010, Low	2015			2020			2025			2030			2045		
		Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
Compact	0.32	0.32	0.31	0.29	0.32	0.31	0.29	0.32	0.31	0.29	0.29	0.27	0.25	0.28	0.26	0.22
Midsize	0.31	0.31	0.31	0.30	0.31	0.31	0.30	0.30	0.28	0.27	0.29	0.26	0.24	0.28	0.25	0.22
Small SUV	0.36	0.36	0.35	0.34	0.36	0.35	0.34	0.37	0.34	0.33	0.39	0.34	0.32	0.37	0.33	0.30
Midsize SUV	0.37	0.37	0.39	0.38	0.37	0.38	0.37	0.38	0.38	0.36	0.40	0.37	0.35	0.39	0.35	0.33
Pickup	0.45	0.45	0.44	0.42	0.44	0.43	0.41	0.44	0.42	0.41	0.43	0.41	0.40	0.42	0.40	0.39

3.6.4 Accessory base load

As shown in Figure 37, the accessory base load is expected to increase over time as the power needed to supply electrical and electronic components increases in accordance with customer expectations (e.g., global positioning system) and powertrain complexity (e.g., added controllers). The values shown in Figure 37 are representative of average consumption during the standard cycle testing (i.e., dynamometer test). Real-world accessory consumption would be higher and are not considered in this study.

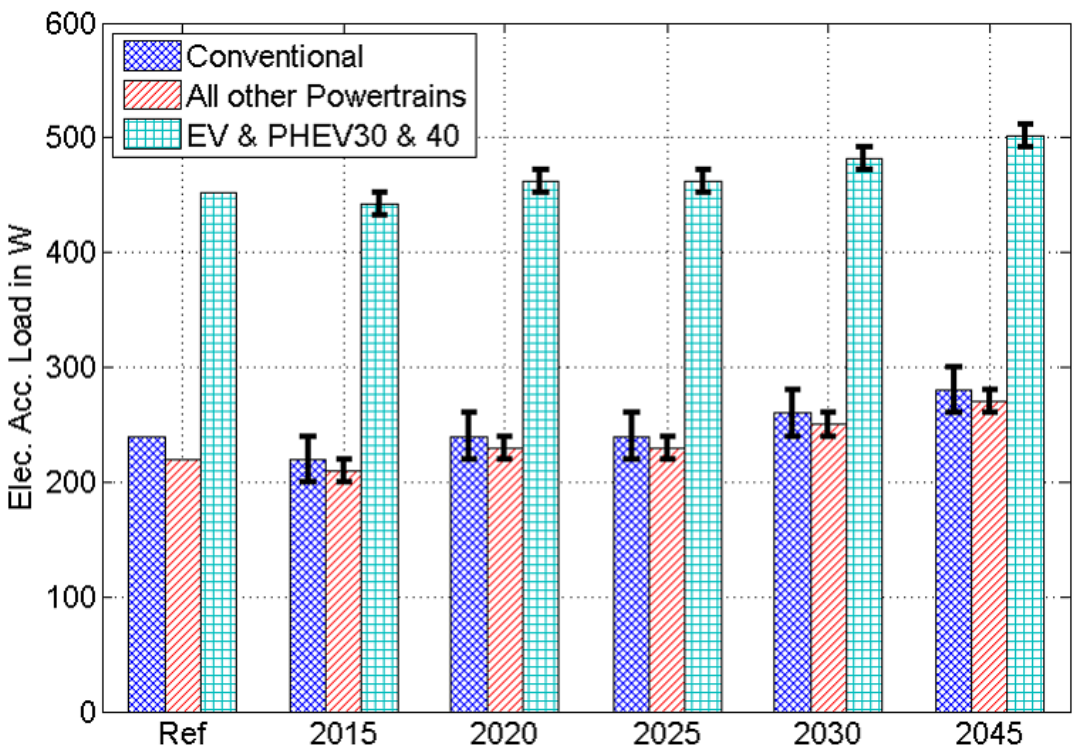


FIGURE 37 Electrical accessory load

4 POWERTRAIN SELECTION

As discussed previously, hundreds of powertrain options are possible. The following powertrains were selected for the EDVs:

- Single-mode power-split HEV with fixed gear ratio (HEV, PHEV10, PHEV20) (Figure 38).
- Series-Split (GM Volt gen 1) configuration (PHEV30, PHEV40) (Figure 39).
- Series fuel cell, 320 miles, with two-speed gearbox (HEV, PHEVs) (Figure 40).
- Electric drive with two-speed gearbox and fixed gear ratio for BEV (100AER, 200AER, and 300AER) (Figure 41).

The reference conventional vehicle is composed of an internal combustion engine coupled to a multi-speed automatic transmission. The power-split configuration is composed of one or multiple planetary gear sets, depending on the electrification degree: input split with two planetary gear sets for HEV and PHEV10 (similar to the Toyota and Ford systems) and a series/output split with one planetary gear set with clutches for PHEV40 (similar to the GM Volt gen 1). A fuel cell HEV as well as a pure BEV were also modeled.

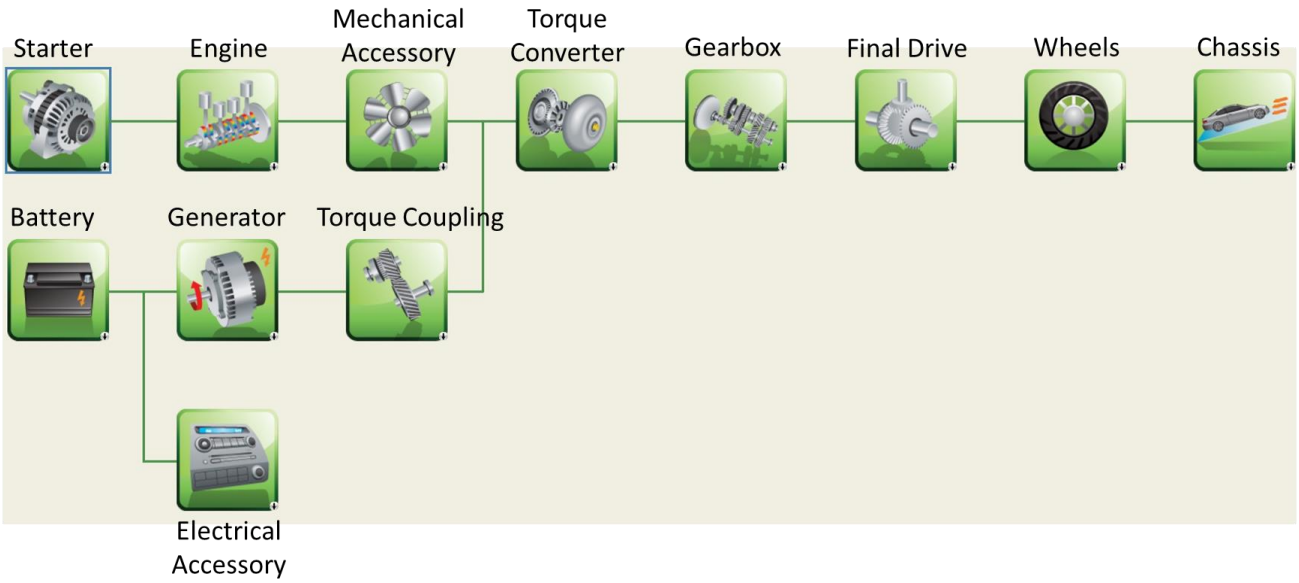


FIGURE 38 Conventional configuration

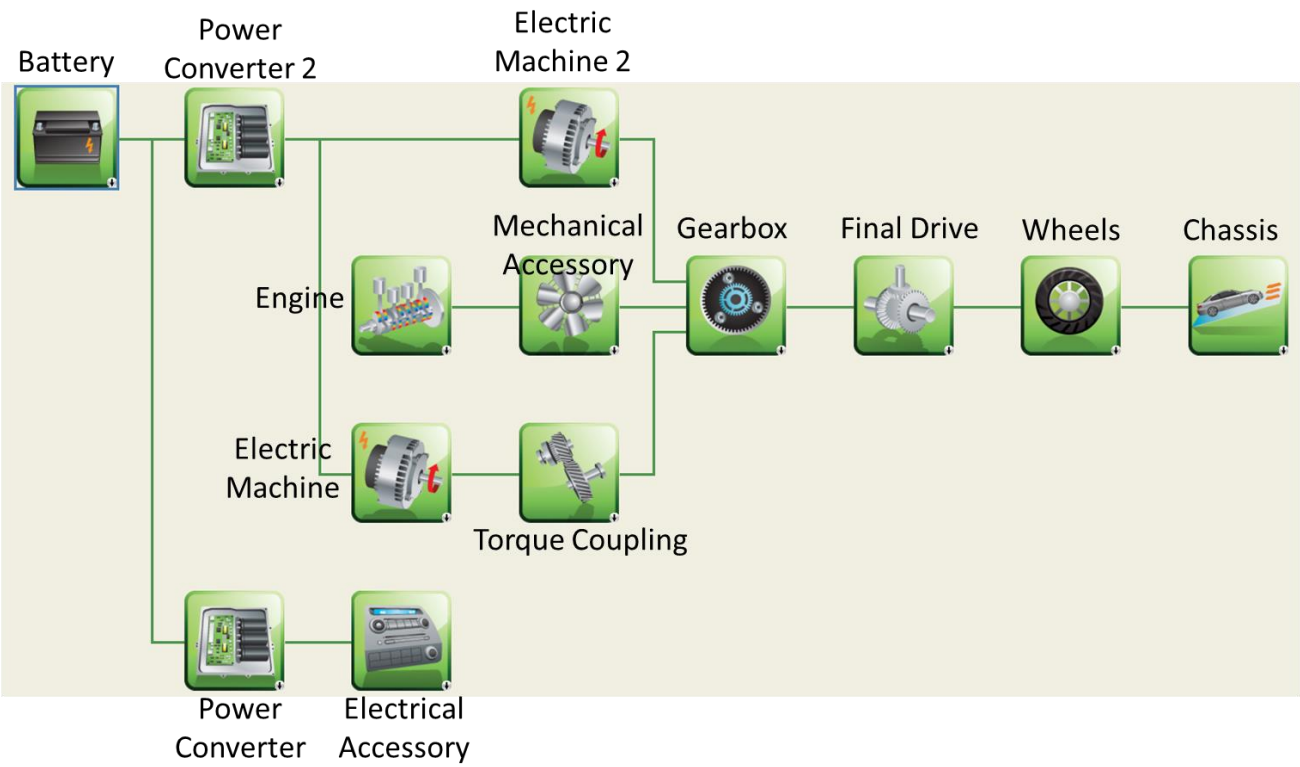


FIGURE 39 Power-split HEV and PHEV configuration

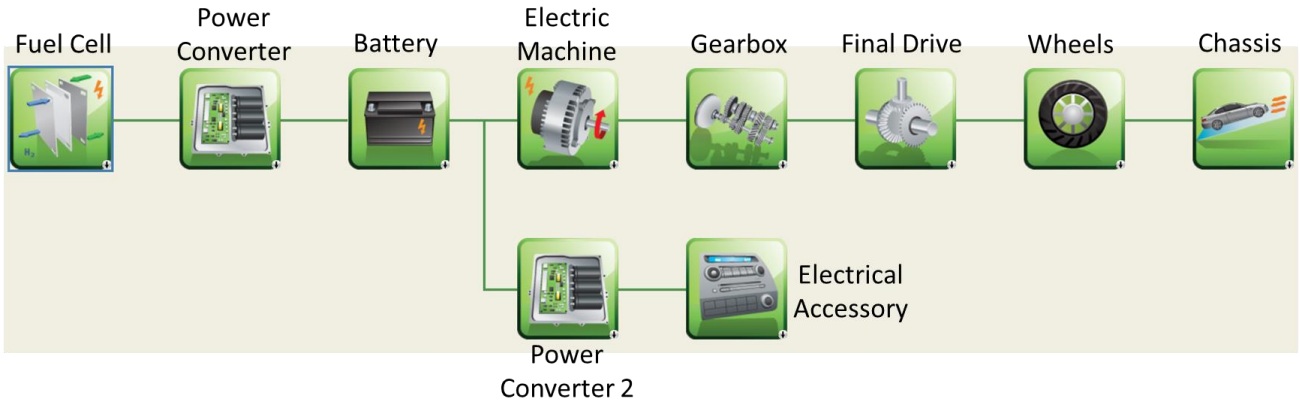


FIGURE 40 Fuel-cell series HEV configuration

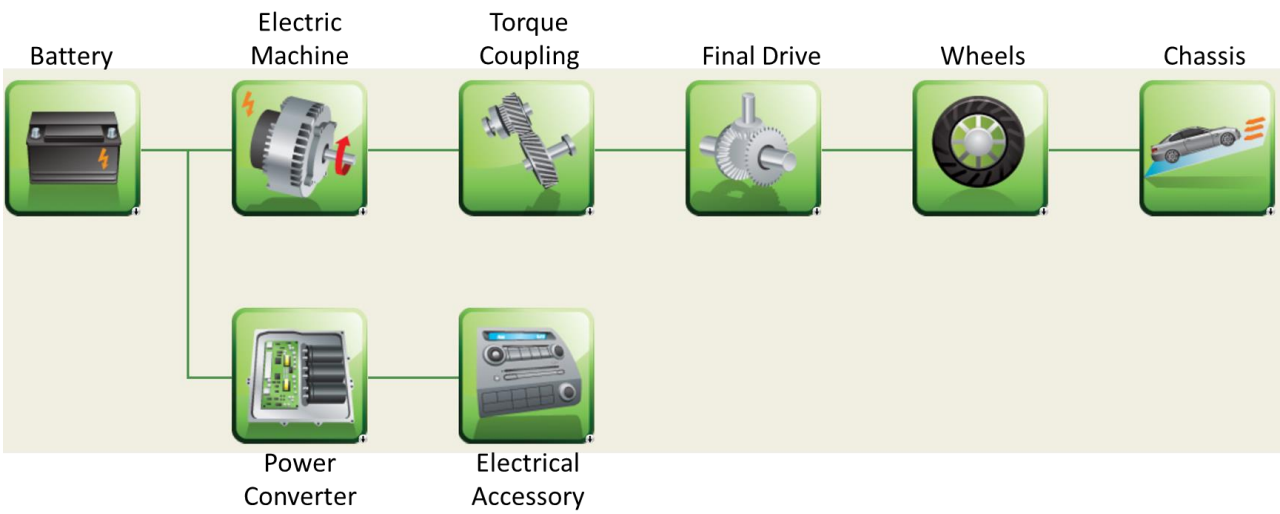


FIGURE 41 BEV configuration

The selection of the single-mode power-split HEV was based on the current sales volume of both Toyota and Ford HEVs, which makes that configuration the dominant one on the market.

The series-split (GM volt gen 1) engine configuration selected is the simplest one. For this option, the E-REV powertrain used in the GM Volt (Tate and Savagian 2009) offers significant advantages, especially during high-vehicle-speed operations.

Vehicles driven solely by electrical power have been modeled with a two-speed gearbox. This choice was made to reach the vehicle maximum-speed requirement of at least 100 mph. This transmission also allows an increase in the powertrain efficiency. Another option to improve the electrical consumption is to use two electric machines (as is the case in the GM Volt gen 1). Electric vehicles with fixed gear ratios have also been modeled.

A significant amount of work has already been done with the single split and E-REV as the powertrain, and vehicle-level controls have been developed and validated using vehicle test data from the APRF (Kim et al. 2009; Karbowski et al. 2010).

5 VEHICLE-LEVEL CONTROL STRATEGIES

Creating a successful design that meets all customer expectations, from performance to fuel consumption and drive quality is critical. The vehicle-level control strategies used for the powertrain described previously were developed over the past 15 years (Pasquier et al. 2001; Pagerit et al. 2005; Sharer et al. 2008; Cao 2007; Karbowski et al. 2006). Generic processes were developed over the years to not only create but also validate the vehicle-level control strategies.

Figure 42 shows the generic process developed by Argonne for energy management. The process is defined in three steps:

- **Global optimization**. The objective of this step is to define the main rules (Karbowski et al. 2006). For example, the engine turns on based on the battery SOC, vehicle speed, and wheel torque demand.
- **Rule-based control**. In this step, the rules from defined in the optimization step are implemented into an algorithm (generally Simulink and StateFlow) and exercised to make sure they operate properly.
- **Heuristic optimization**. The last step defines the values of the parameters of the main control strategy. For example, at which wheel torque does the engine turn on for a specific SOC? Argonne generally uses the DIRECT (DIvided RECTangles) algorithm to automatically define the parameters.

Other approaches, such as instantaneous optimizations (Karbowski et al. 2010) have also been developed and implemented in Autonomie. Rule based controllers were used to support this study.

Argonne has several state-of-the-art vehicle dynamometers and has been involved in testing and developing test procedures for advanced vehicles for many years. Over the past 15 years, numerous vehicle configurations from different classes have been tested at the APRF. A large number were modeled and validated into the Powertrain System Analysis Toolkit and now Autonomie. These included conventional starter-alternators, full HEVs (input power-split, dual-mode power-split), PHEVs (both after-market and manufacturer prototypes), and BEVs. The vehicles were validated within 1% for the conventional vehicles, 2% for starter-alternators, and 5% for HEVs, which in all cases is within the test-to-test repeatability.

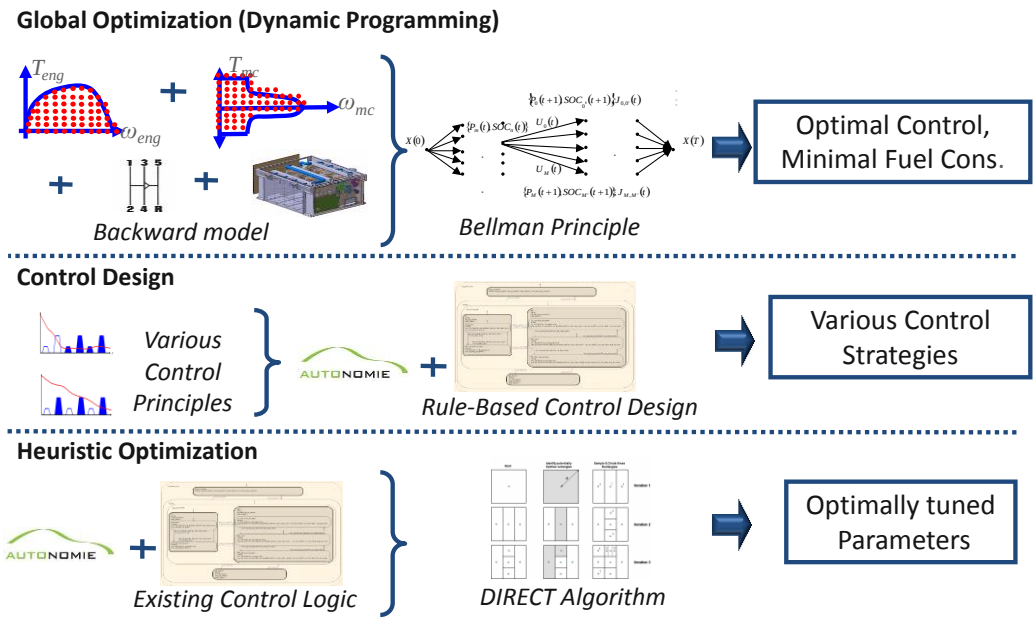


FIGURE 42 Vehicle-level control strategy development

6 VEHICLE DEFINITION

6.1 VEHICLE TECHNICAL SPECIFICATIONS

All the vehicles were sized to meet the same requirements:

- Initial vehicle movement (IVM) to 60 mph less than 9 sec ±0.1 sec.
- Maximum grade of 6% at 65 mph at gross vehicle weight (GVW).
- Maximum vehicle speed >100 mph.

These requirements are a good representation of the current American automotive market, as well as American drivers' expectations. A relationship between curb weight and GVW was developed using current vehicles to verify that the grade requirements are met.

6.2 POWERTRAIN SIZING ALGORITHMS

Because of the large number of vehicles (several thousand) and the diversity of powertrain options, it is not feasible to manually size each vehicle's components to match the performance targets. Some studies defined their vehicles by maintaining a constant P/W ratio between all powertrain configurations. Due to the impact of the component maximum torque curves, maintaining a constant P/W ratio between all configurations leads to an inconsistent comparison between technologies because of different performances. Each vehicle should be sized independently to meet specific VTS.

Not properly sizing the components will lead to differences in both energy consumption and cost and will influence the results. For example, the P/W ratio for a 2010 midsize vehicle with IVM = 60 mph in 9 sec varies from 75 W/kg to 85 W/kg, depending on the powertrain configuration. This difference will increase in the future because of a decrease in weight penalty for electrified powertrains.

On this basis, we developed several automated sizing algorithms to provide a fair comparison between technologies. Different algorithms were defined depending on the powertrain (i.e., conventional, power-split, series, electric) and the application (i.e., HEV, PHEV).

All algorithms were based on the same concept: the vehicle is built from the bottom up, meaning each component assumption (i.e., specific power, efficiency, etc.) was taken into account to define the entire set of vehicle attributes (i.e., weight, etc.). This process is always iterative in the sense that the main component characteristics (i.e., maximum power, vehicle weight, etc.) are changed until all the VTS are

met. On average, the algorithm takes between 5 and 10 iterations to converge. Figure 43 illustrates the iterative process for a conventional vehicle.

The rules were specific to the various powertrains and applications. For example:

- For HEVs, the electric-machine and battery powers were determined to capture all the regenerative energy from a UDDS cycle. The engine and the generator were then sized to meet the gradeability and performance requirements (e.g., IVM to 60 mph).
- For PHEV10s and PHEV20s, the electric-machine and battery powers were sized to be able to follow the UDDS cycle in electric-only mode (this control was only used for the sizing; a blended approach was used to evaluate consumptions). The battery-usable energy was defined to follow the UDDS drive cycle for 10 mi or 20 mi, depending on the requirements. The engine was then sized to meet both performance and gradeability requirements (usually, gradeability is the determining factor for PHEVs).
- For PHEV30s and PHEV40s, the main electric-machine and battery powers were sized to be able to follow the aggressive US06 drive cycle (duty cycle with aggressive highway driving) in electric-only mode. The battery-usable energy was defined to follow the UDDS drive cycle for 30 mi or 40 mi, depending on the requirements. The genset (engine + generator) or the fuel-cell systems were sized to meet the gradeability requirements.

It is important to note that the sizing algorithms provided the optimum component sizes when OEMs would have to select among the available choices.

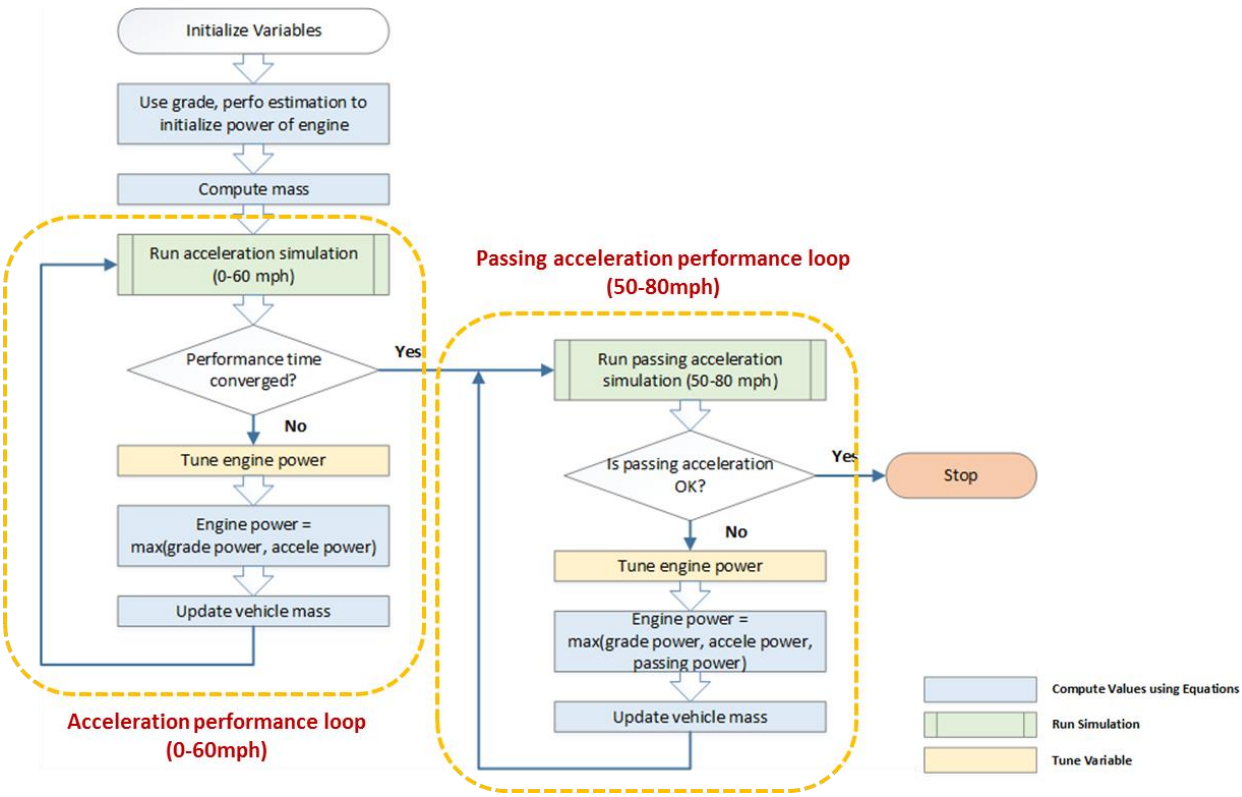


FIGURE 43 Conventional powertrain sizing algorithm

6.3 SIZING RESULTS

This section describes the maximum power, energy, and weight of the different vehicles after sizing.

6.3.1 Conventional Powertrain

The component characteristics of each vehicle class evolved similarly. In the following section, to avoid presenting too many figures and plots, only the midsize class is presented.

Figure 44 shows the gasoline-engine peak power. One notices a small decrease in peak power due to lightweighting.

Figure 45 shows the peak power of the diesel, CNG, and ethanol engines compared with the gasoline engine. One notices that the diesel, CNG, and ethanol ratios stay roughly constant over time at about 0.9, indicating that technology improvements (e.g., weight reduction, aerodynamics) influence all engine technologies similarly with respect to engine peak efficiency.

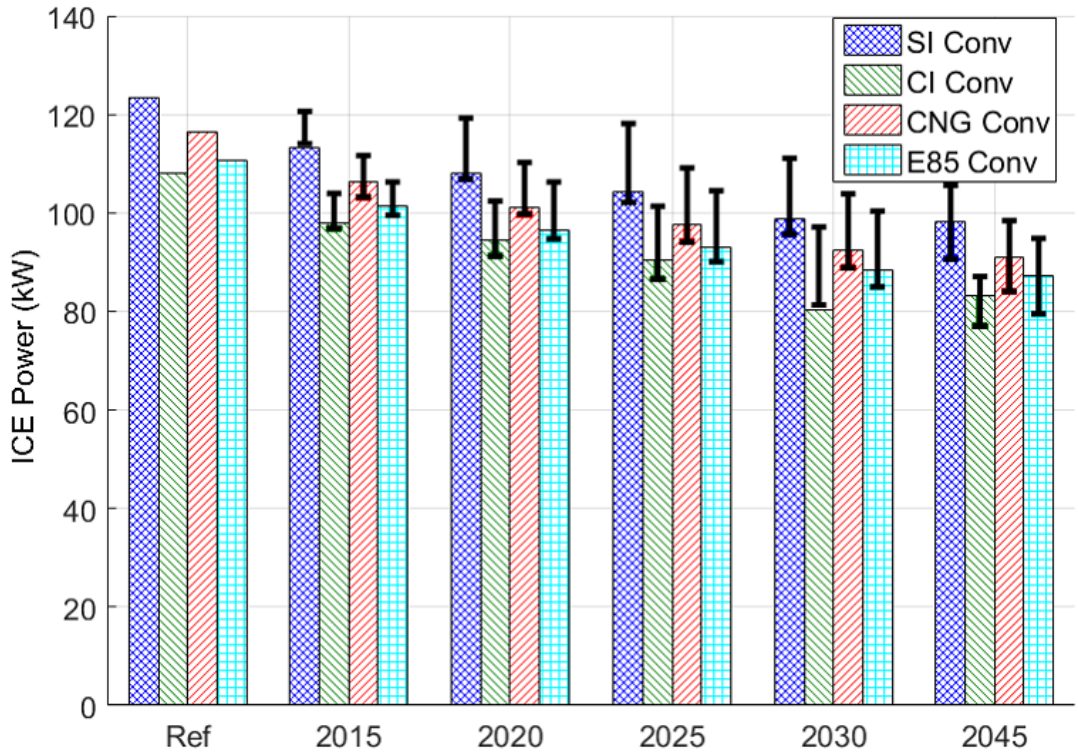


FIGURE 44 Engine peak power with conventional powertrain for midsize cars

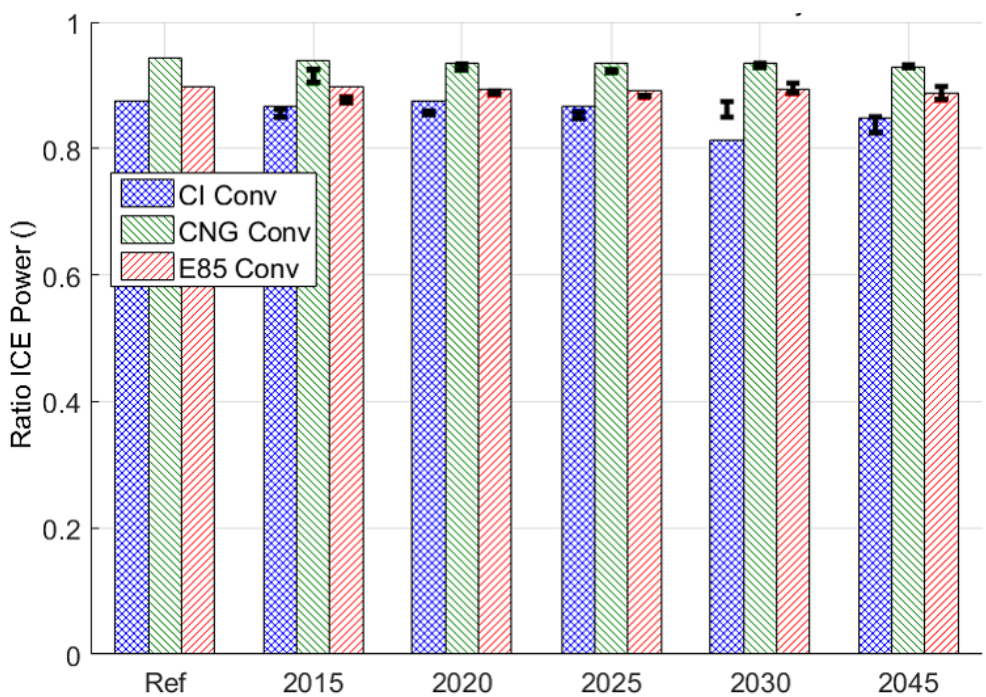


FIGURE 45 Engine peak power compared with the same-year, same-case conventional gasoline engine for midsize cars

Figure 46 shows that engine power changes linearly with vehicle weight. The fuel order tracks the power ratios previously described. All engine technologies cover the same mass range but do not require the same power; higher torque is present at lower engine speed in the diesel case.

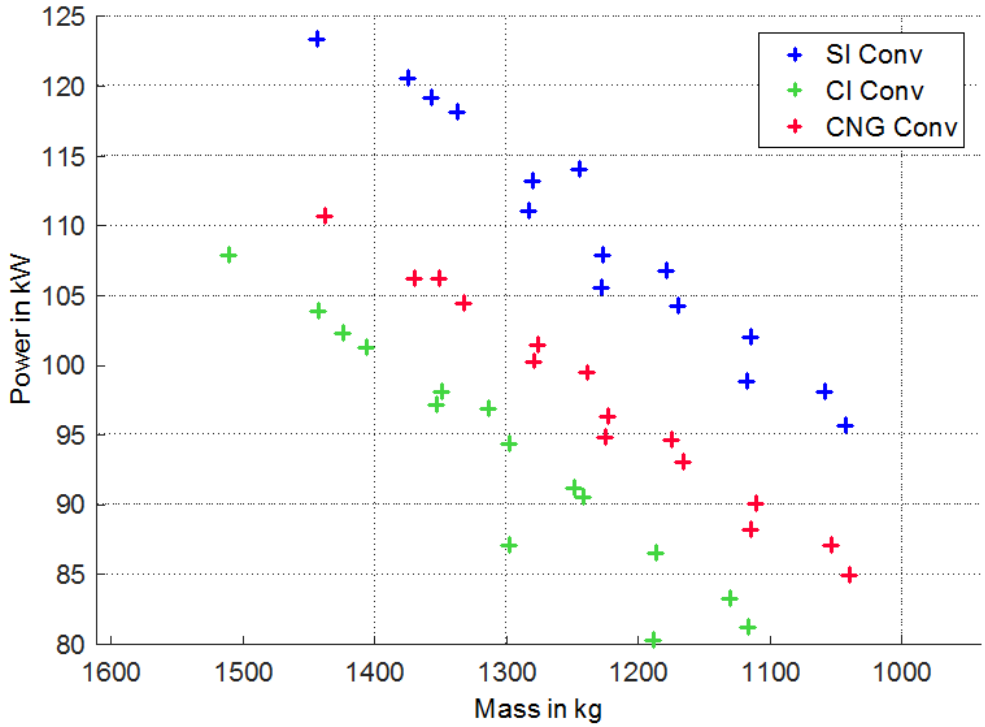


FIGURE 46 Engine peak power as a function of vehicle mass for conventional engines

6.3.2 Engine HEV

6.3.2.1 Engine

Figure 47 shows the peak power for midsize HEVs with gasoline engines. The engine power for HEVs is determined by both the performance and grade requirements. While performance is the primary factor for current technologies, future lightweighting makes gradeability requirements critical for some cases.

The ICE peak-power ratios also stay roughly constant over time for the power-split HEVs (Figure 48) with approximately the same ratio over time, slightly above 1. Engine sizes are comparable across fuels for HEVs over time, unlike conventional engines where the use of diesel, CNG, or ethanol fuels leads to engine downsizing.

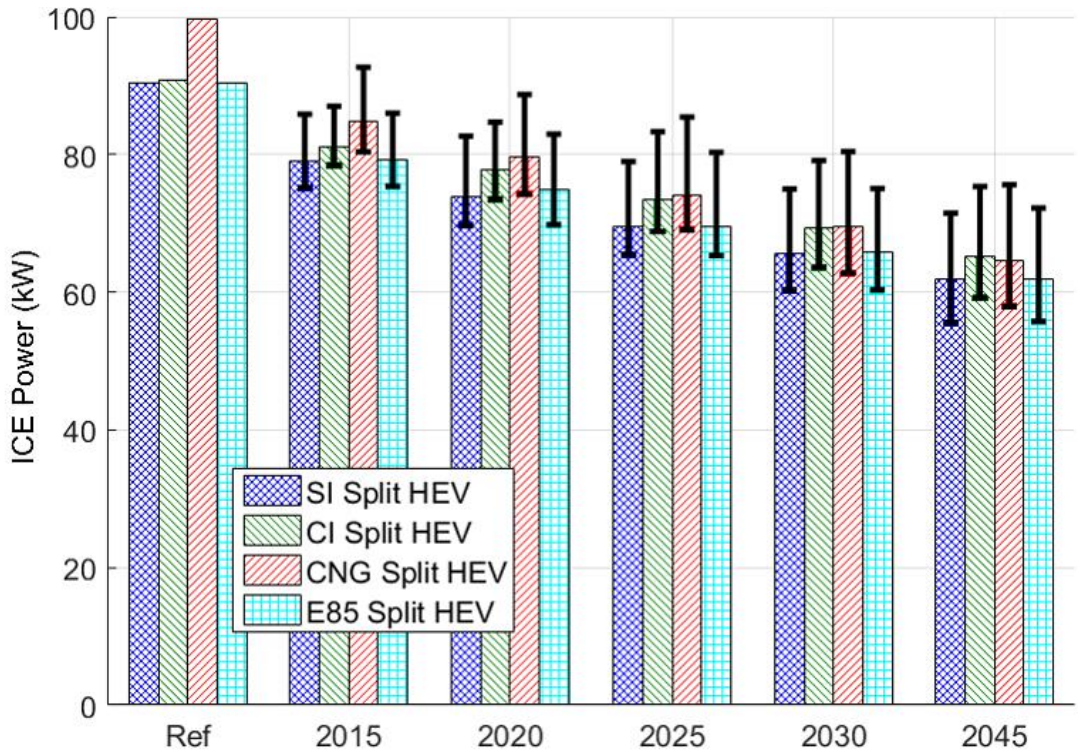


FIGURE 47 Engine peak power for midsize HEVs with conventional powertrains

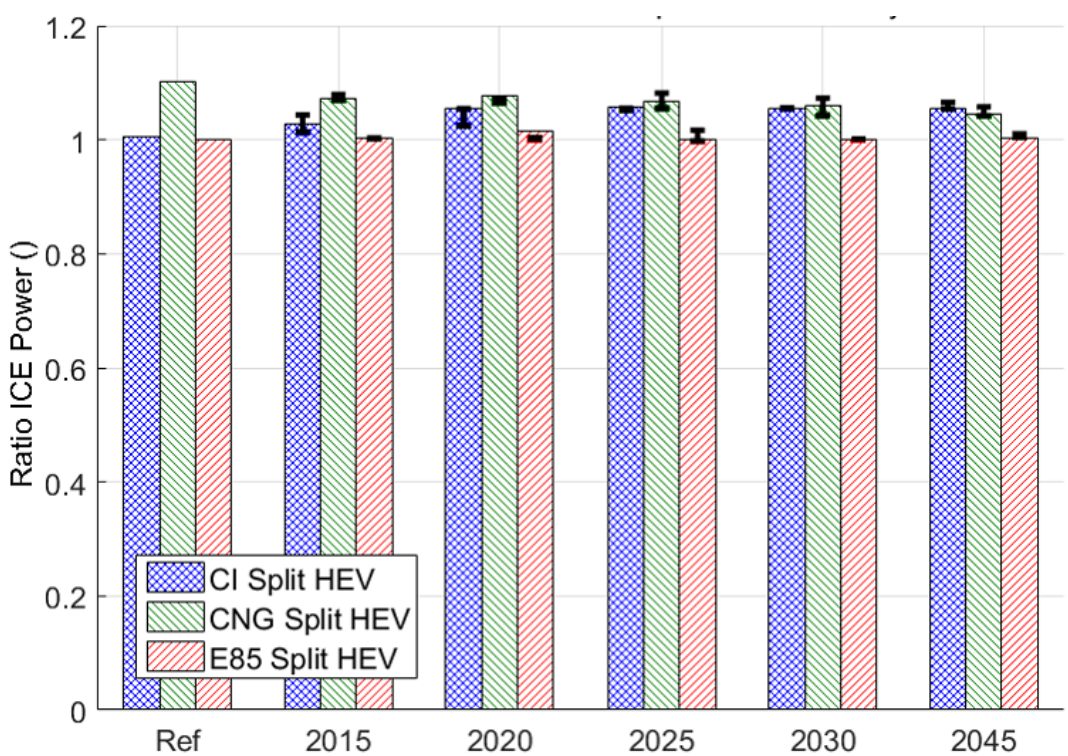


FIGURE 48 Engine peak power compared with the same-year, same-case gasoline split-HEV engine for midsize cars

6.3.2.2 Electric Machine

Figure 49 shows the electric-machine power for HEVs with different fuels.

As shown in Figure 50, the peak-power ratios stay roughly constant over time. The diesel-split HEV has a less powerful electric machine than the gasoline-split HEV. However, the CNG-split HEV electric machine is more powerful than the gasoline vehicle in 2010 through 2045. For the ethanol vehicle, the electric-machine ratios are in the same range as the ICE power ratios.

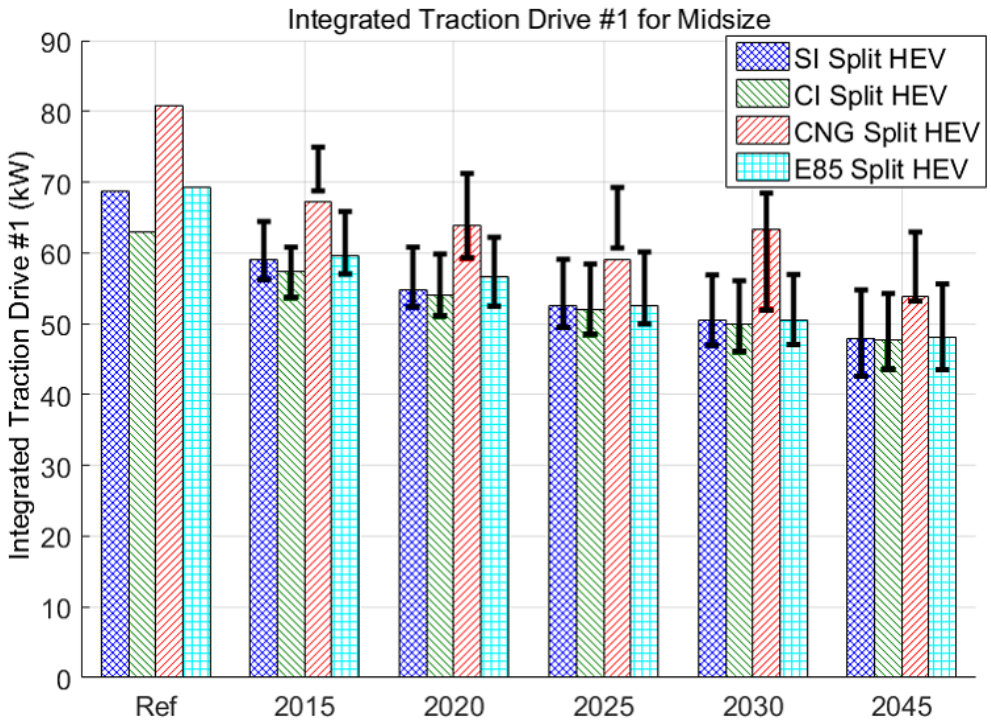


FIGURE 49 Electric-machine power for midsize split HEVs

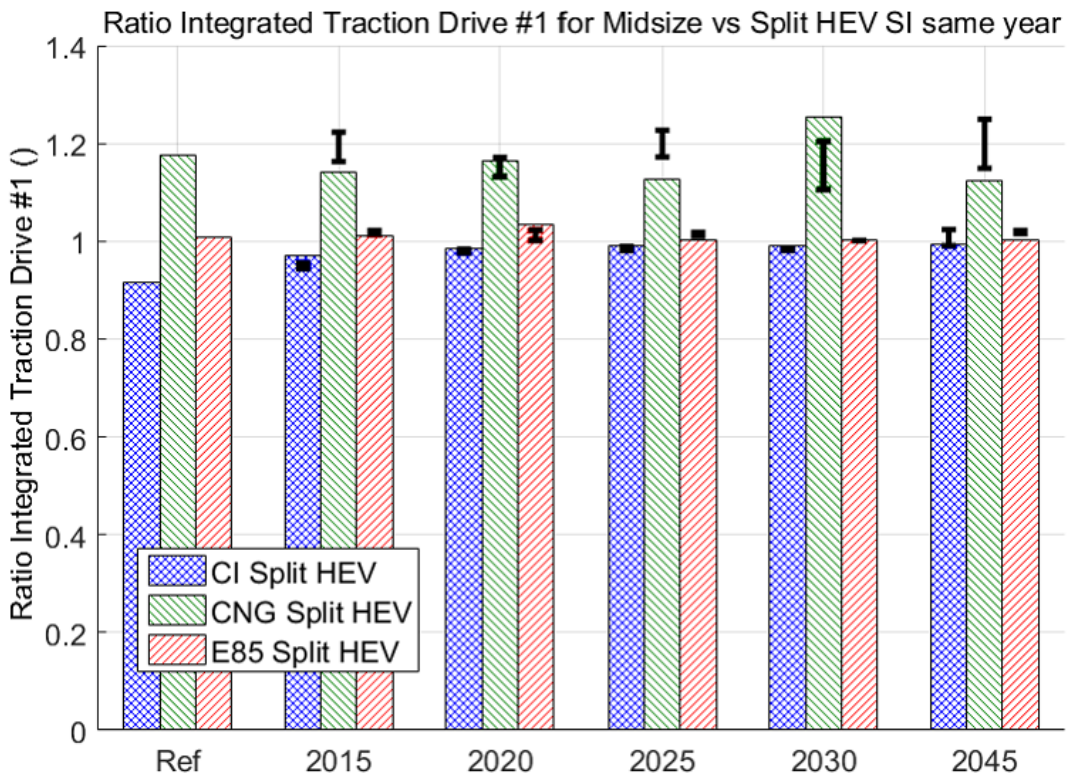


FIGURE 50 Ratio of electric-machine peak power for gasoline split-HEV engines for midsize cars

6.3.2.3 Battery

Figure 51 shows the HEV battery power. The powers were determined to capture the entire energy during deceleration on the UDDS drive cycle. Lightweighting and increased component efficiencies contribute to lower battery peak power.

Since the sizing algorithm for HEVs does not modify the battery capacity, the trend of the total energy follows the total power (Figure 52).

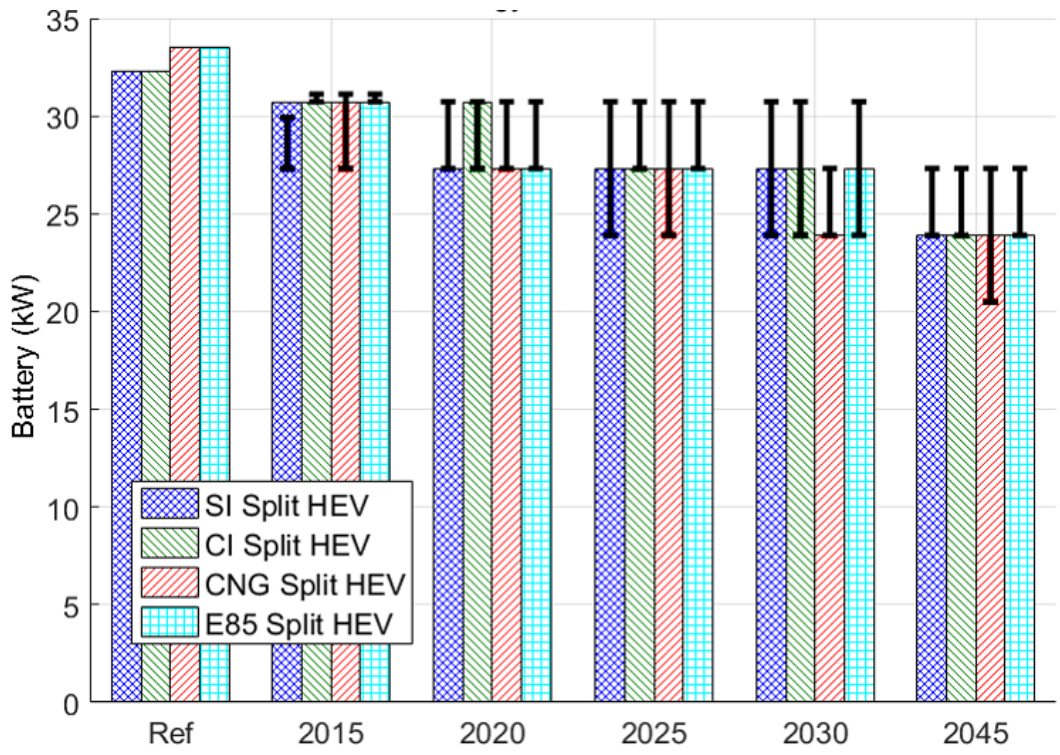


FIGURE 51 Battery power for midsize gasoline HEVs

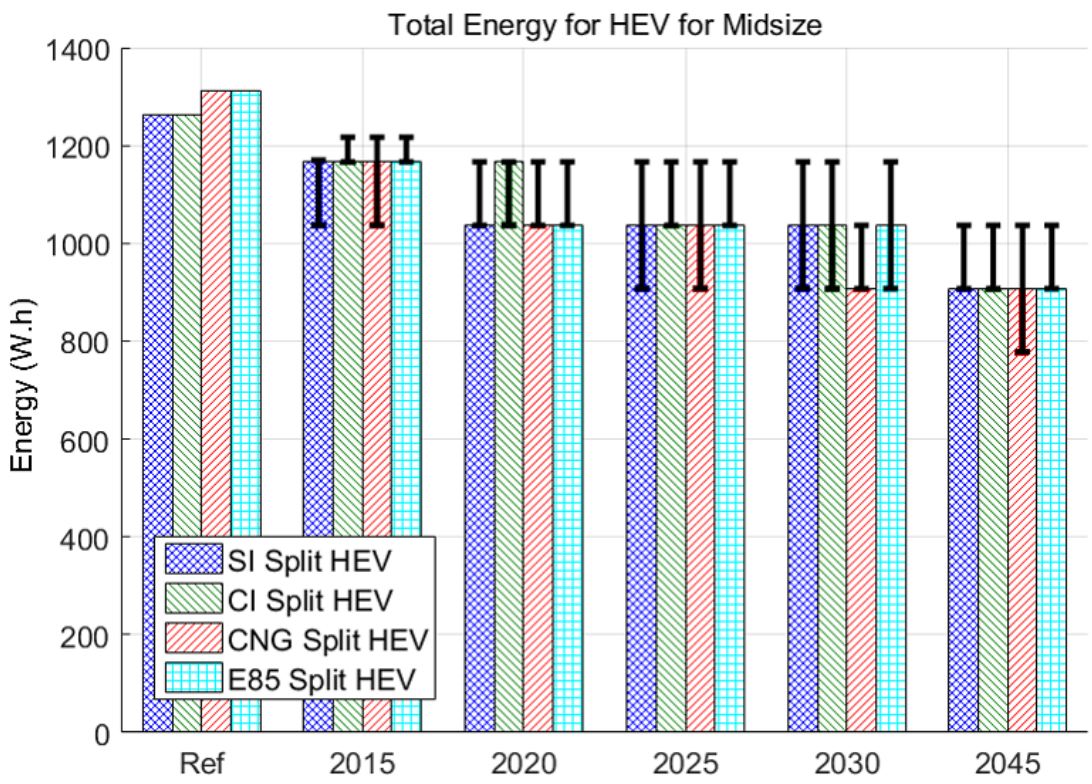


FIGURE 52 Total battery energy for midsize HEVs

6.3.3 PHEV

6.3.3.1 Engine

Figure 53 shows the gasoline-engine peak power for the various PHEV powertrains and timeframes. In this case, because of the large electric machine, the engines were all sized to provide acceptable gradeability.

Across all the AERs for power-split PHEVs, flex-fuel engines have power similar to their gasoline counterparts, while CNG engines are the most powerful. The power ratios between the various engines and the gasoline engine (Figure 54) are stable over time and from one AER to another. The trends are similar for PHEV30s and PHEV40s.

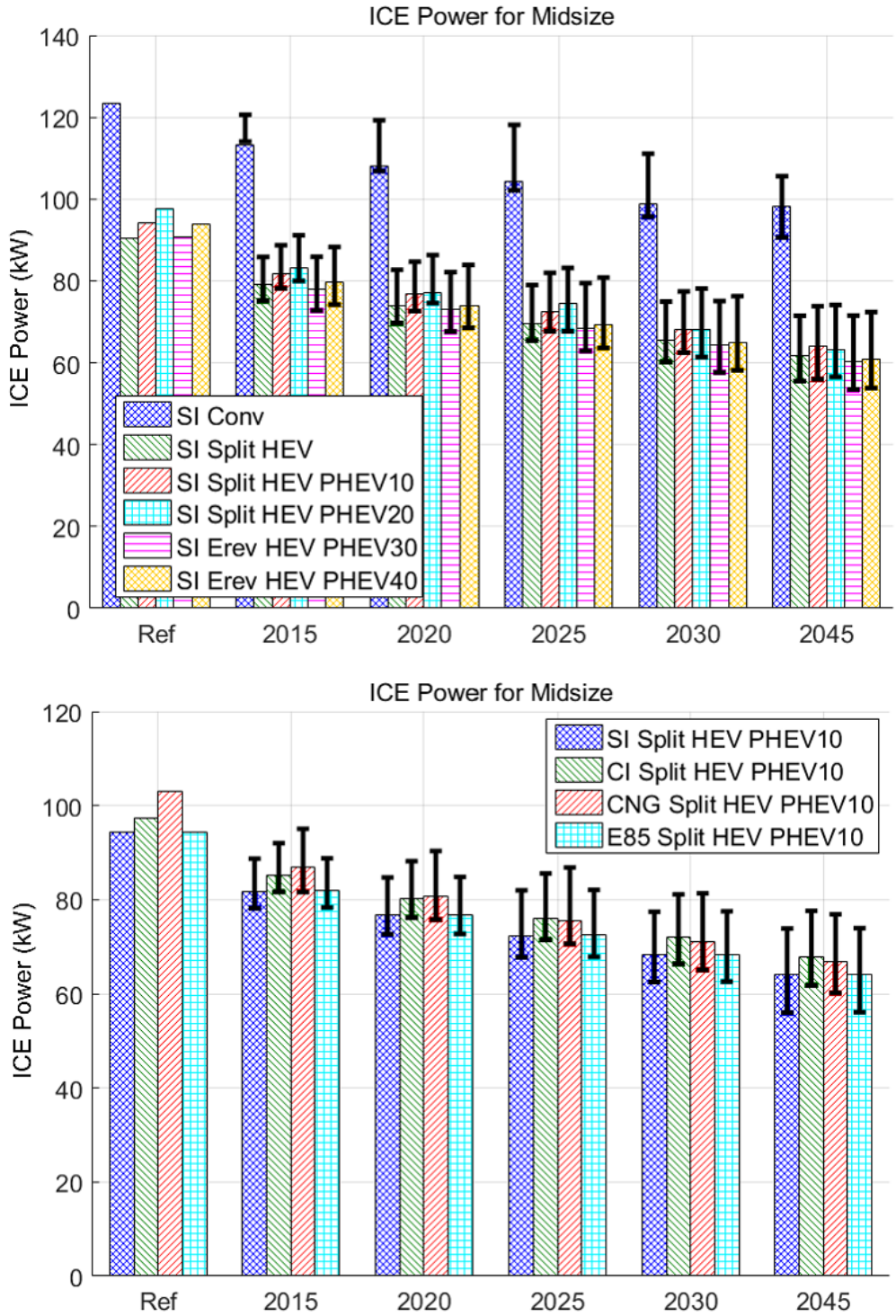
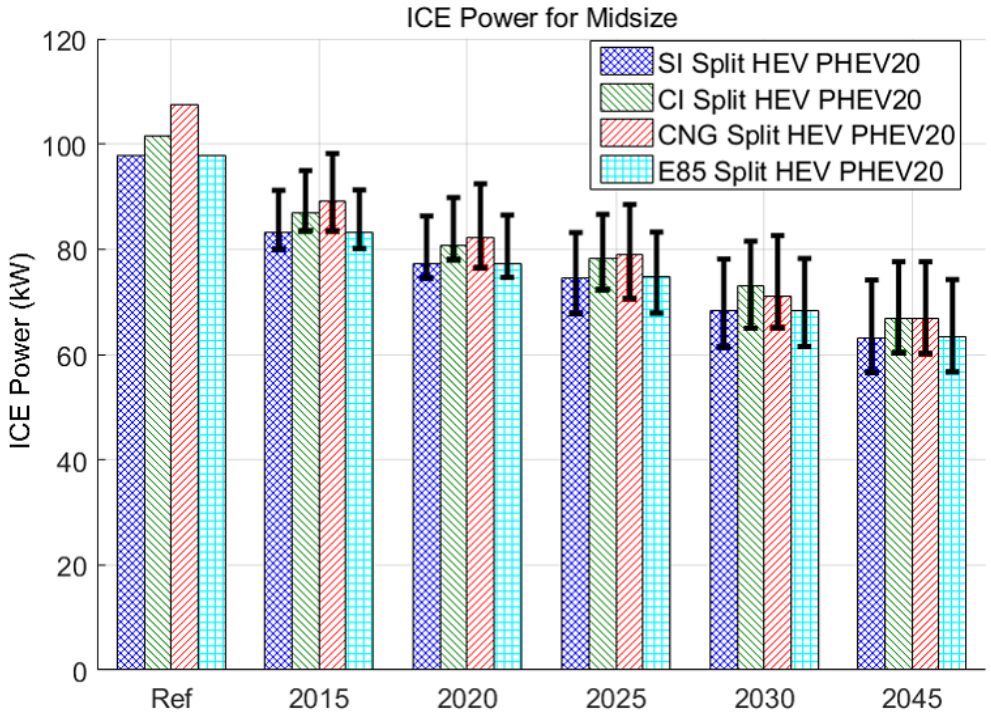


FIGURE 53 Engine peak power for midsize PHEV powertrains: (1) comparison with conventional and across range classes, (2) PHEV10s, (3) PHEV20s, (4) PHEV30s, and (5) PHEV40s



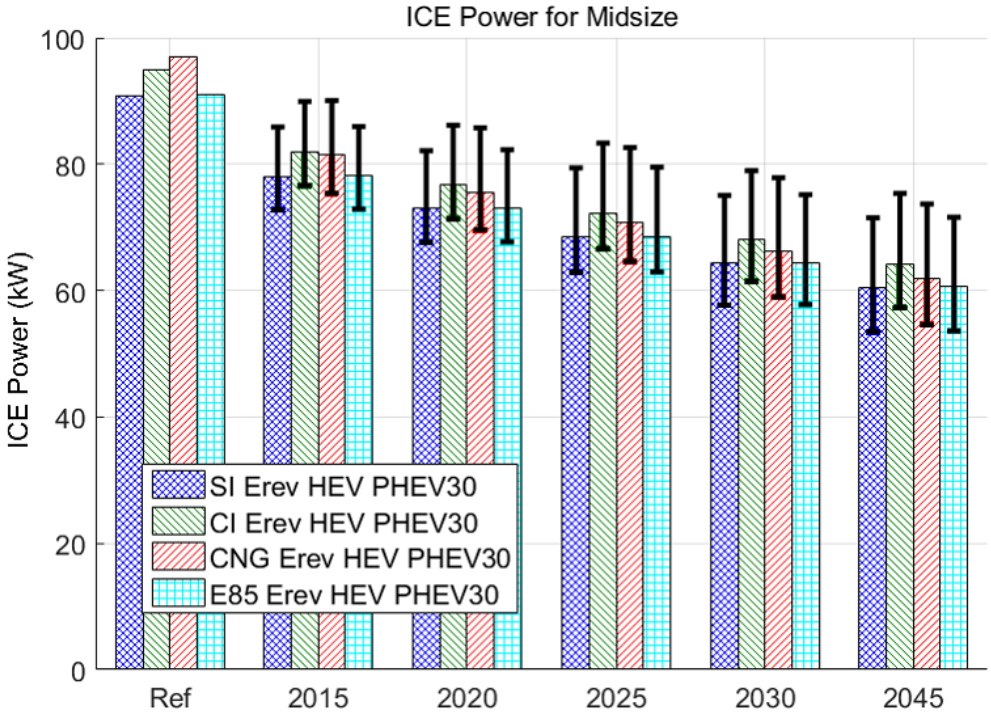


FIGURE 53 Engine peak power for midsize PHEV powertrains: (1) comparison with conventional and across range classes, (2) PHEV10s, (3) PHEV20s, (4) PHEV30s, and (5) PHEV40s (Cont.)

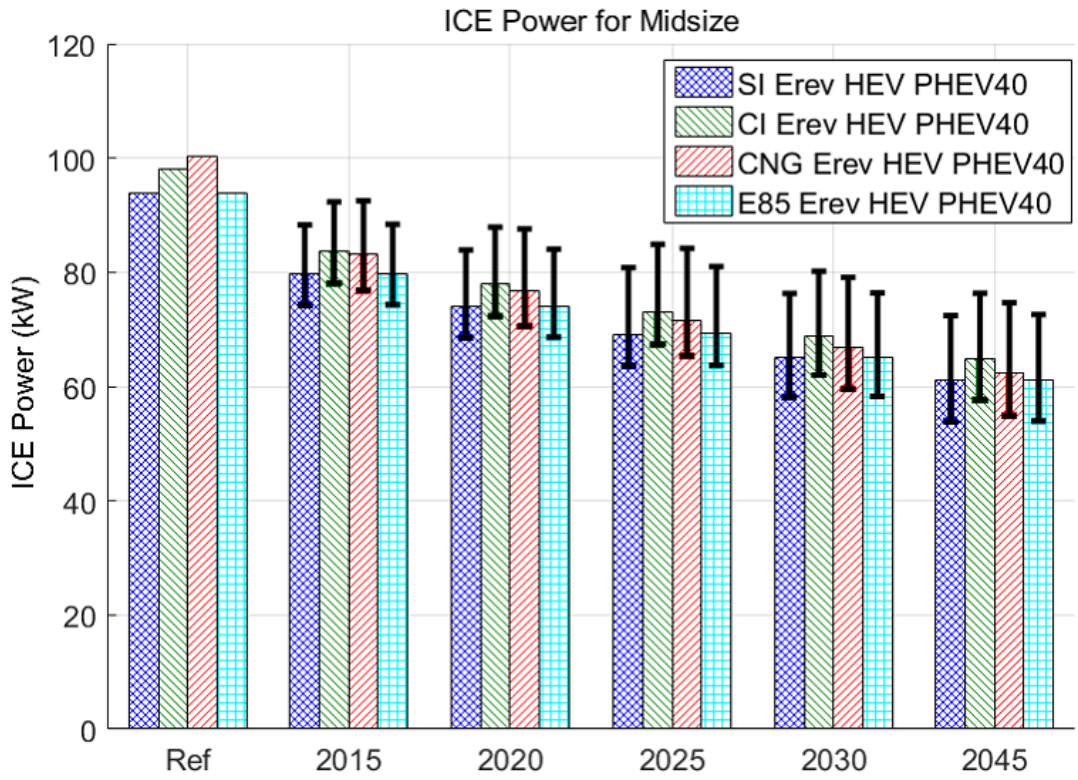


FIGURE 53 Engine peak power for midsize PHEV powertrains: (1) comparison with conventional and across range classes, (2) PHEV10s, (3) PHEV20s, (4) PHEV30s, and (5) PHEV40s (Cont.)

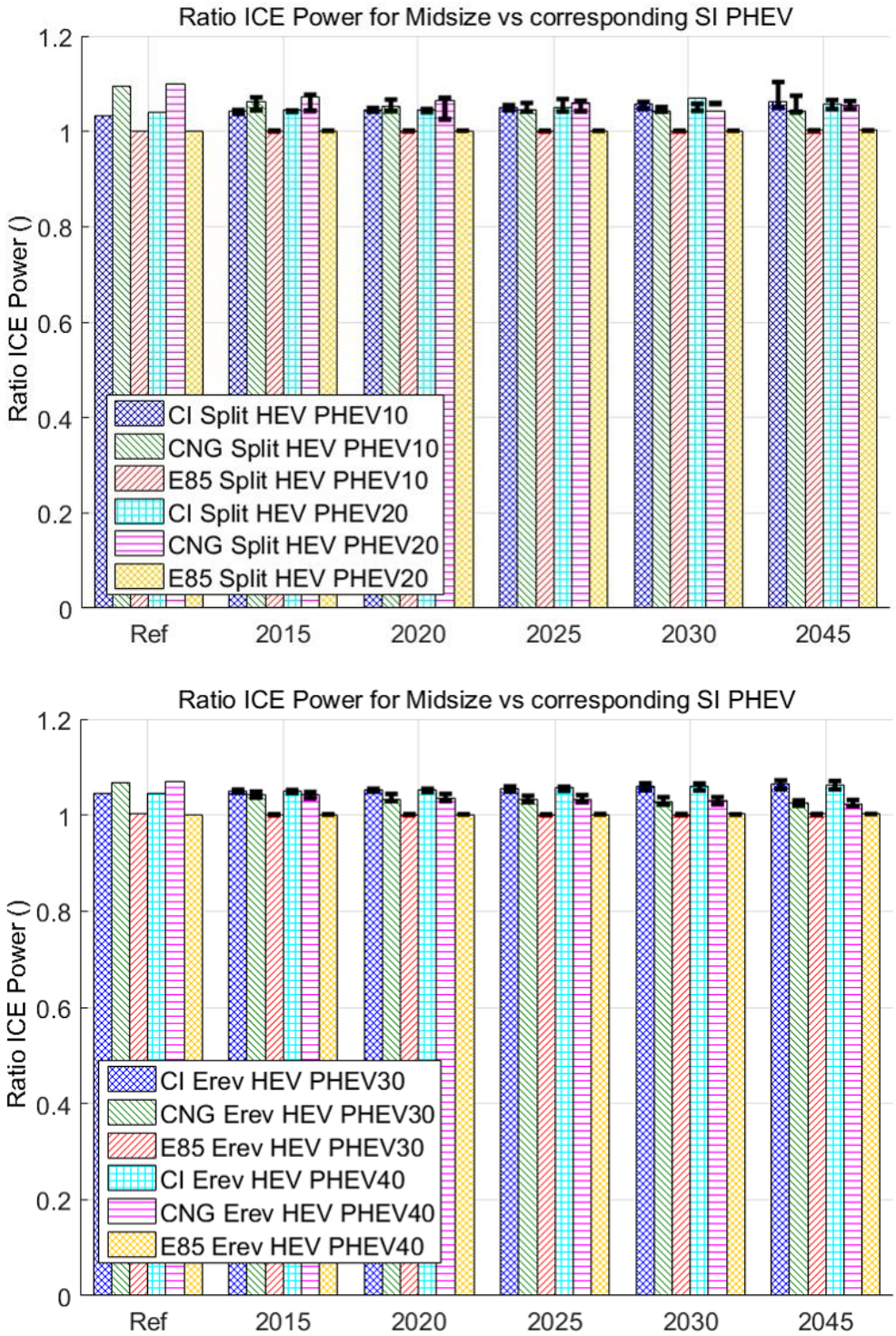


FIGURE 54 ICE power for midsize PHEV10s and PHEV20s (top) and PHEV30s and PHEV40s (bottom) relative to gasoline PHEVs with matching AER

6.3.3.2 Electric Machine

Figure 55 shows the peak power of the different electric machines for the PHEVs. The electric machines for the PHEV10 and PHEV20 cases were sized to have the capability to follow the UDDS drive cycle in electric mode. The electric machines for the PHEV30 and PHEV40 cases were sized to allow the vehicles to follow the US06 drive cycle. Technology evolution leads to power reductions ranging from 17% to 30% by 2045 for PHEV10s and PHEV20s, from 23% to 42% for PHEV30s, and from 28% to 46% for PHEV40s (gasoline).

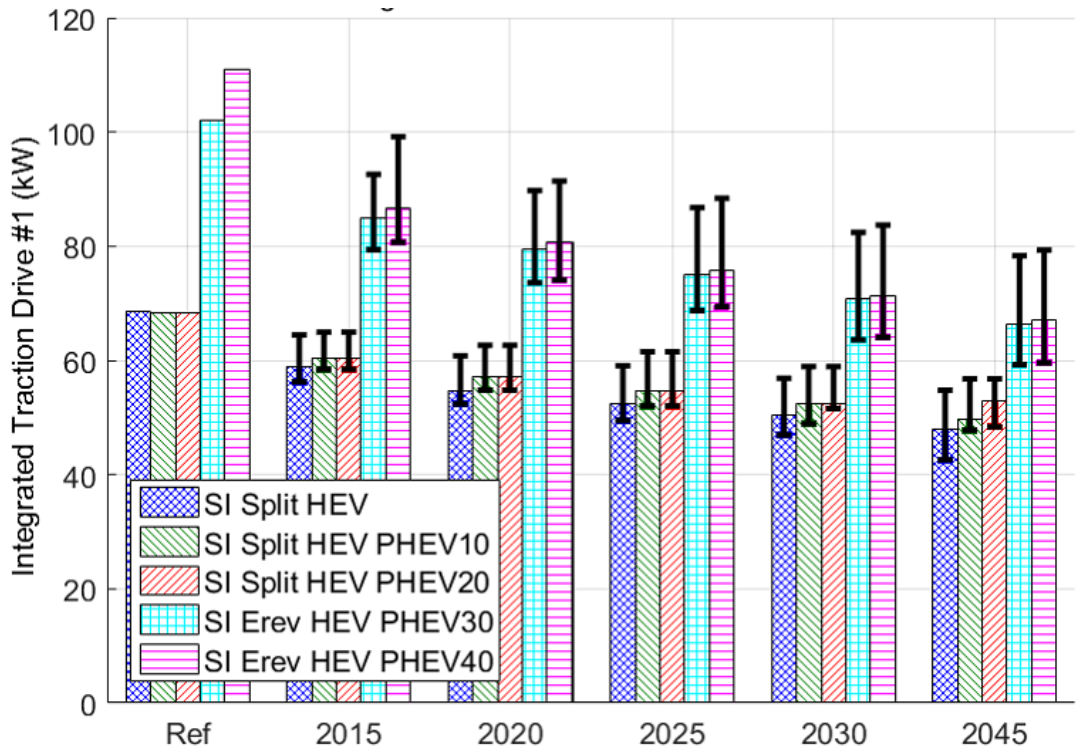


FIGURE 55 Electric machine power for midsize PHEVs

6.3.3.3 Battery

Figure 56 shows that the battery power for the PHEV10 and PHEV20 classes decreases by 23% to 40% over time and for PHEV30s and PHEV40s decreases by nearly 30% to 50%. The battery for the PHEV30 and PHV40 classes has nearly three times more power than that of the PHEV10 and PHEV20 classes because of the need to follow the US06 cycle in electric-only mode. From one AER to the next, the battery power increases by an average of 2% for power-split and by an average of 3% for E-REV powertrains.

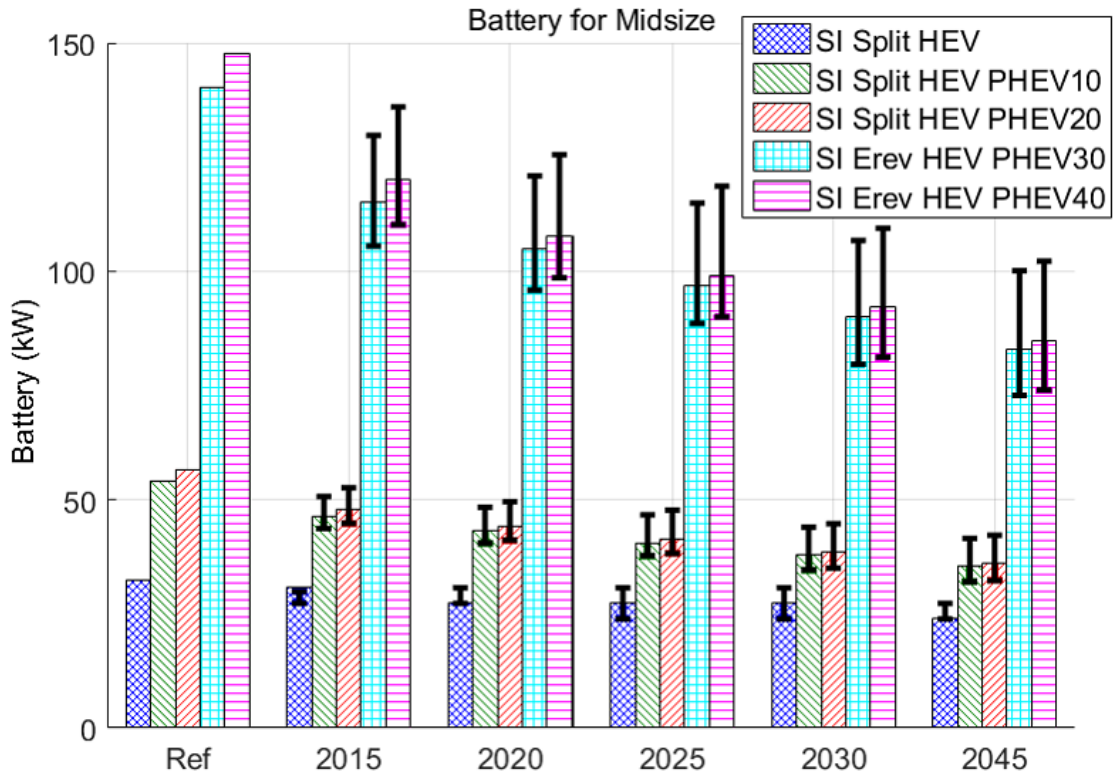


FIGURE 56 Battery power for midsize gasoline HEVs and PHEVs

Figure 57 shows that the usable battery energy is proportional to the AER for the various PHEVs. If the AER doubles, the usable battery energy will also double. For all of the AERs, the usable energy decreased from 25% to 50% by 2045.

The PHEVs all show a linear relationship between the usable battery energy and the vehicle mass (Figure 58). However, it appears that the higher the AER, the greater the slope.

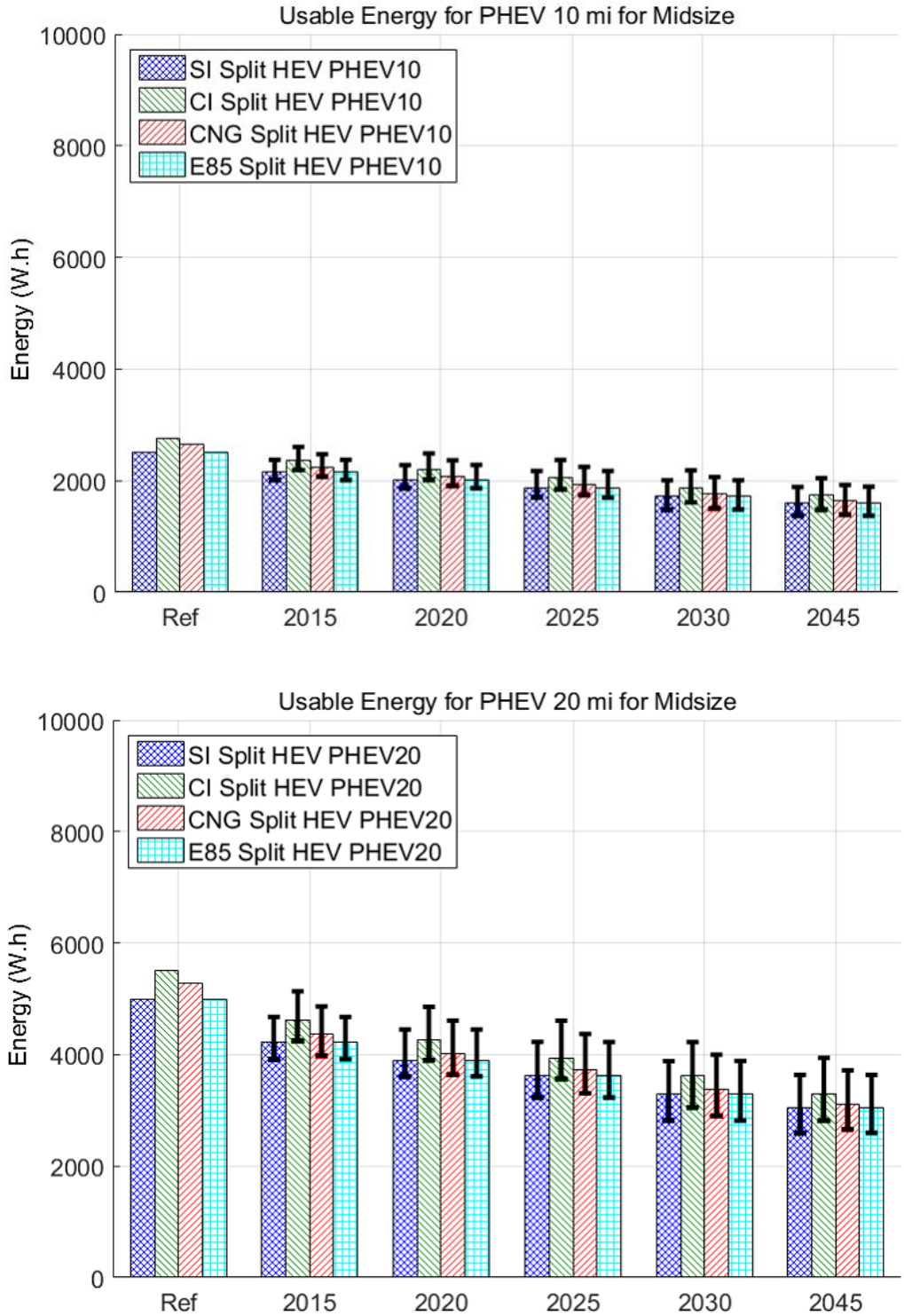
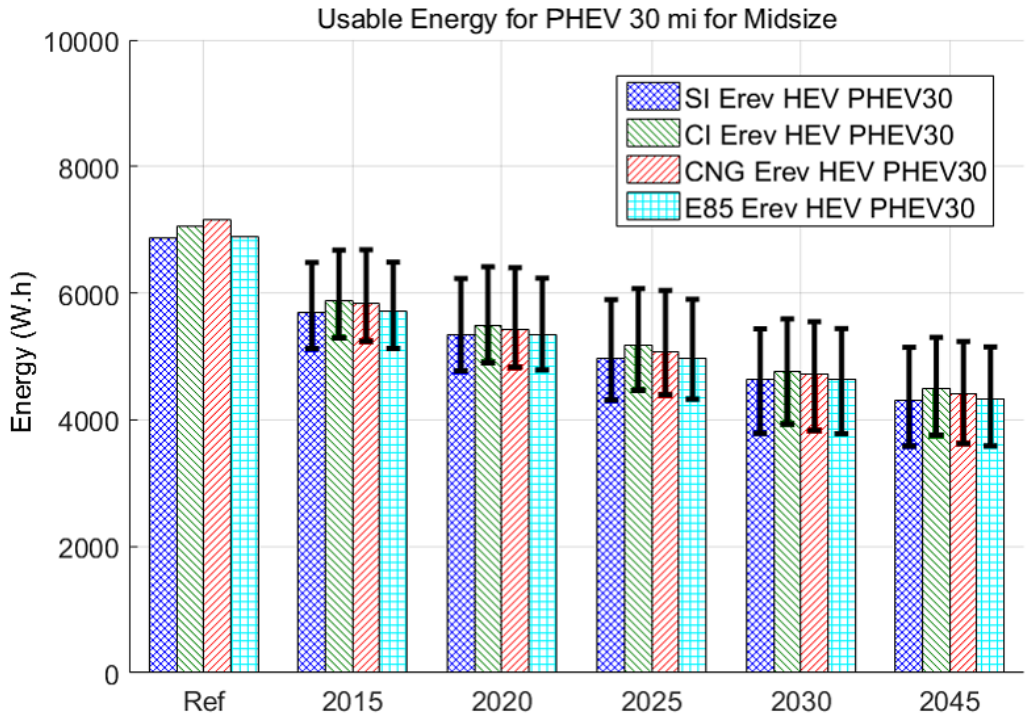


FIGURE 57 Usable battery energy for midsize PHEVs: (1) PHEV10s, (2) PHEV20s, (3) PHEV30s, and (4) PHEV40s



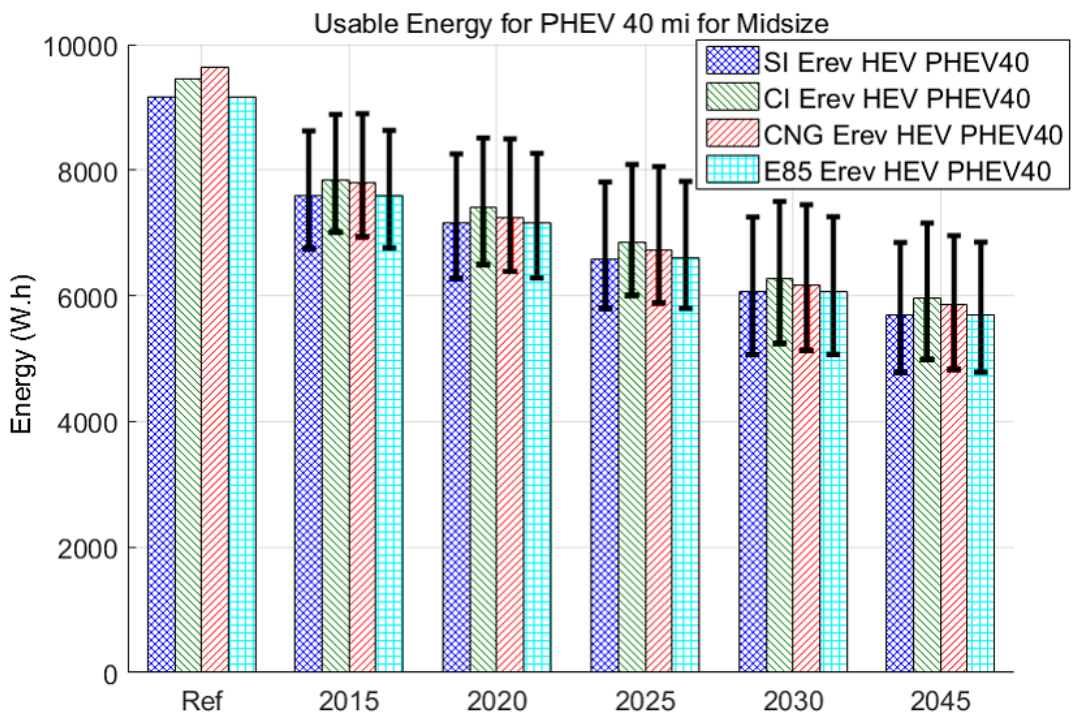


FIGURE 57 Usable battery energy for midsize PHEVs: (1) PHEV10s, (2) PHEV20s, (3) PHEV30s, and (4) PHEV40s (Cont.)

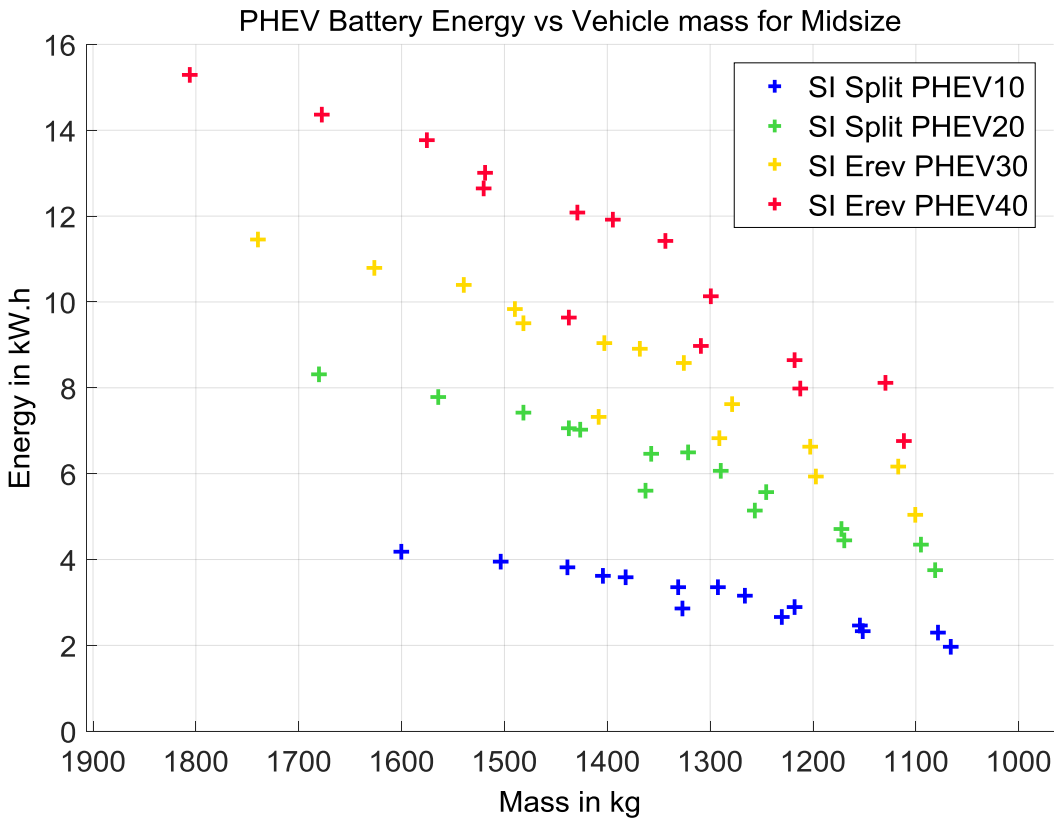


FIGURE 58 Total battery energy as a function of vehicle mass for gasoline PHEVs

6.3.4 Fuel-Cell HEV

Fuel-cell systems, like other components, show a decrease in peak power over time (Figure 59), which is mostly due to vehicle lightweighting and better fuel efficiency. The total decrease from the reference case to the 2045 case ranged from 20% to 41%.

Figure 60 shows that the electric-machine peak power shows a decrease ranging from 15% to 34% between 2010 and 2045.

Total battery energy (Figure 61) shows a continuous decrease over time as well.

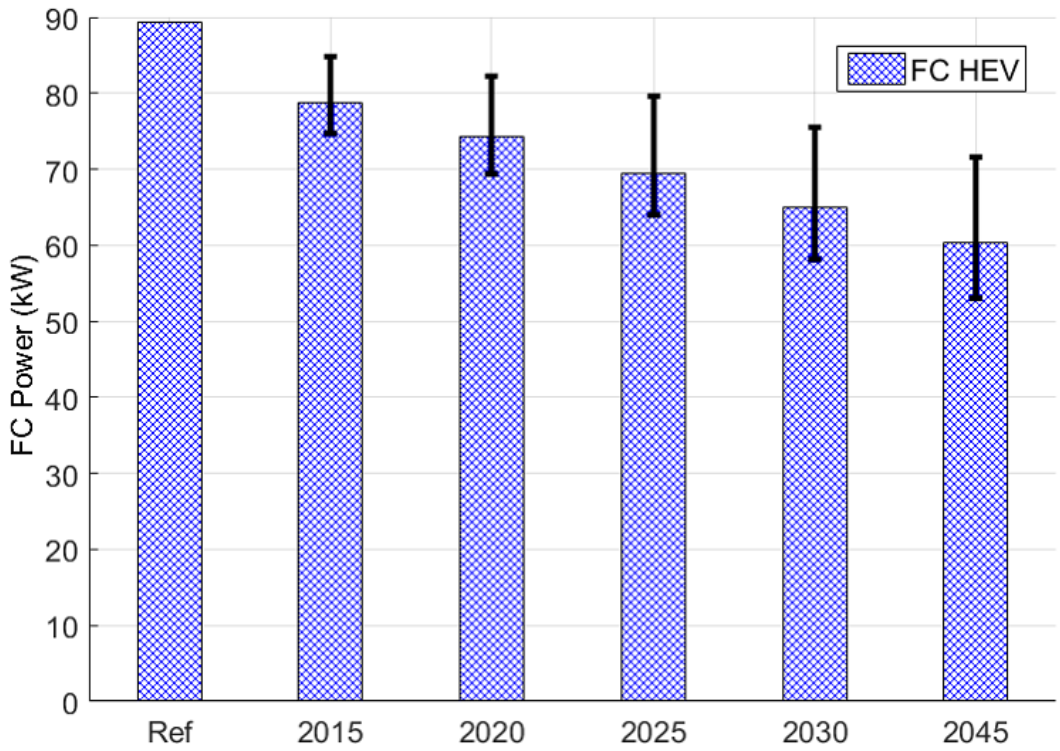


FIGURE 59 Fuel-cell system power for midsize fuel-cell HEVs

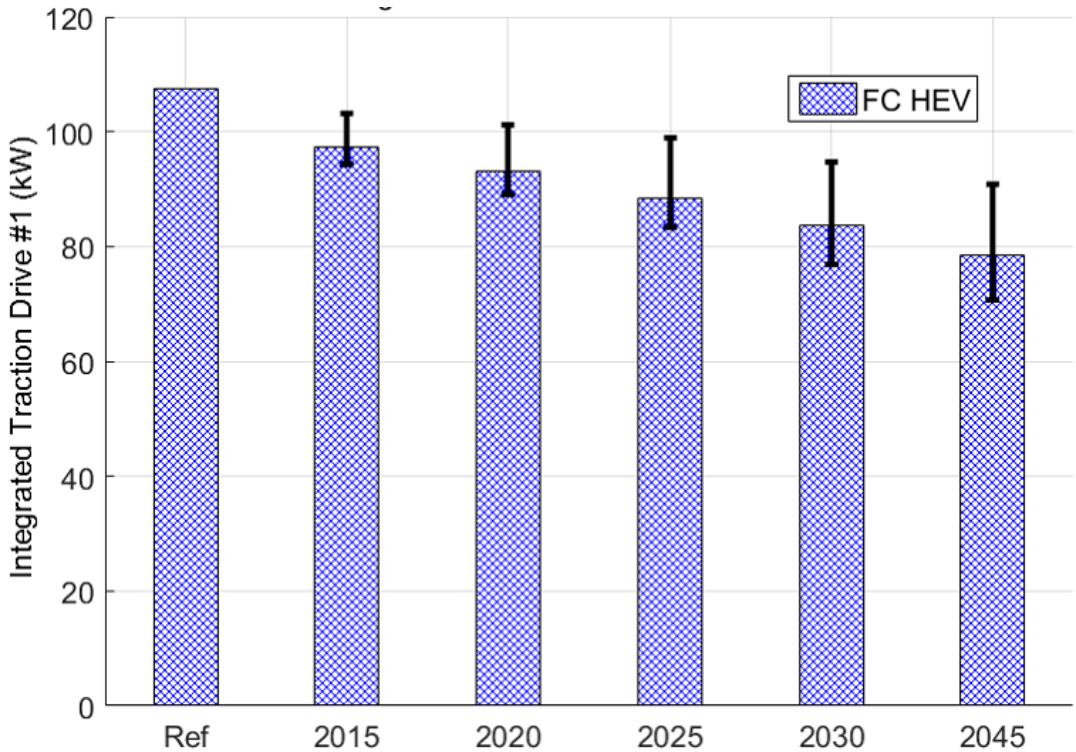


FIGURE 60 Electric-machine power for midsize fuel-cell HEVs

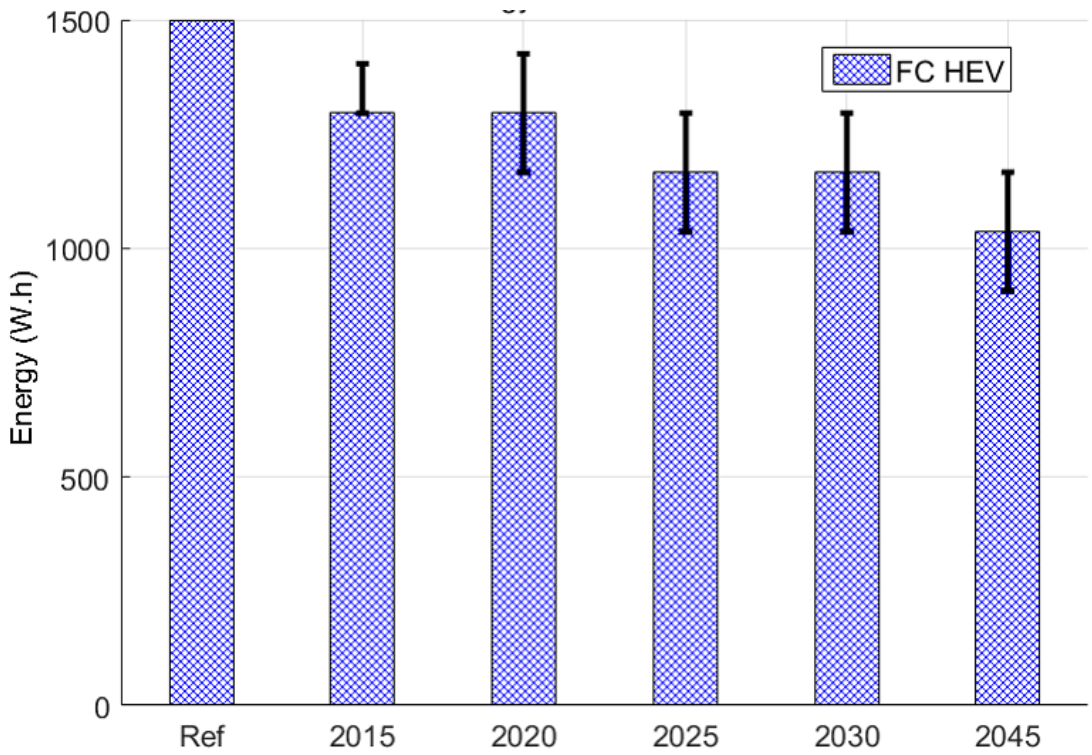


FIGURE 61 Total battery energy for midsize fuel-cell HEVs

6.3.5 Fuel-Cell PHEV

The fuel-cell system power decreases over time for all the AERs, with a reduction that ranges from 22% to 46% (Figure 62). From one AER to another, the changes in fuel-cell power are very small.

As shown in Figure 63, in terms of usable battery energy, the same pattern described for power-split PHEVs can be observed for fuel-cell PHEVs. The energy is proportional to the AER, and it decreases continuously over time. For all of the AERs, the usable battery energy is from 20% to 41% lower (PHEV10), from 22% to 43% lower (PHEV20), from 29% to 48% lower (PHEV30), and from 30% to 51% lower (PHEV40) by 2045 compared with the reference case. The rate of change appears to increase with higher AER.

The electric-machine power continuously decreases by between 19% and 37% over time from the reference case to 2045 (Figure 64). The higher the AER, the higher the electric-machine power within the same year and case.

As shown in Figure 65, the battery energy has a linear relationship to vehicle mass, with a slope that increases with the AER.

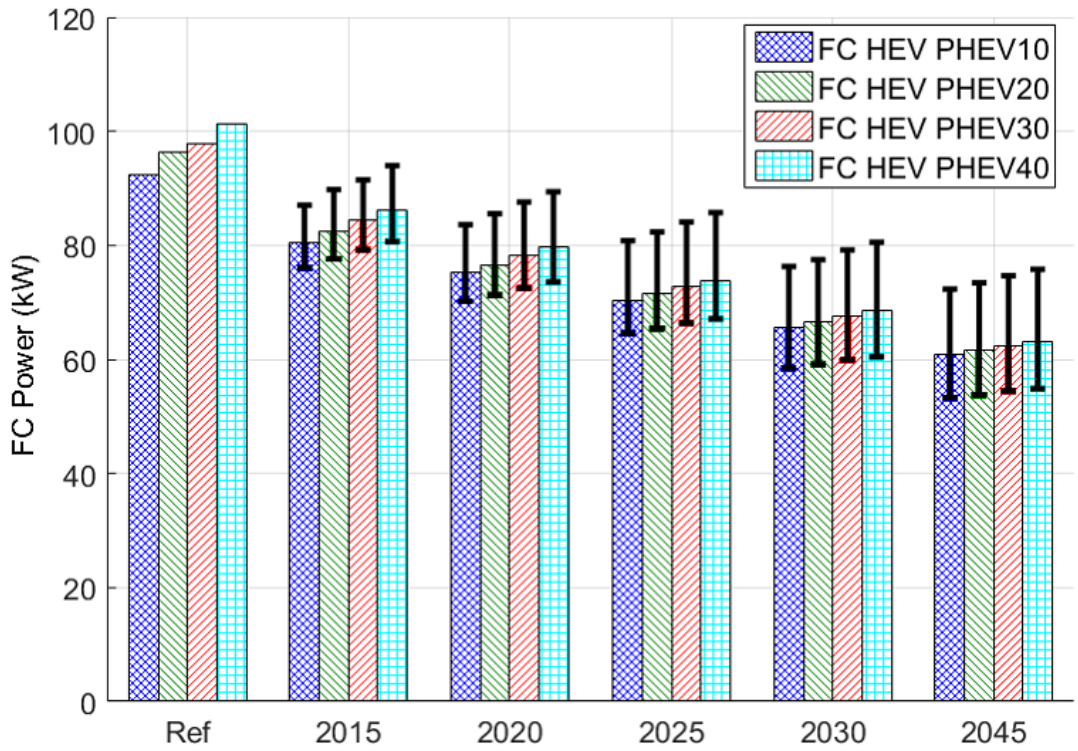


FIGURE 62 Fuel-cell system power for midsize fuel-cell PHEVs

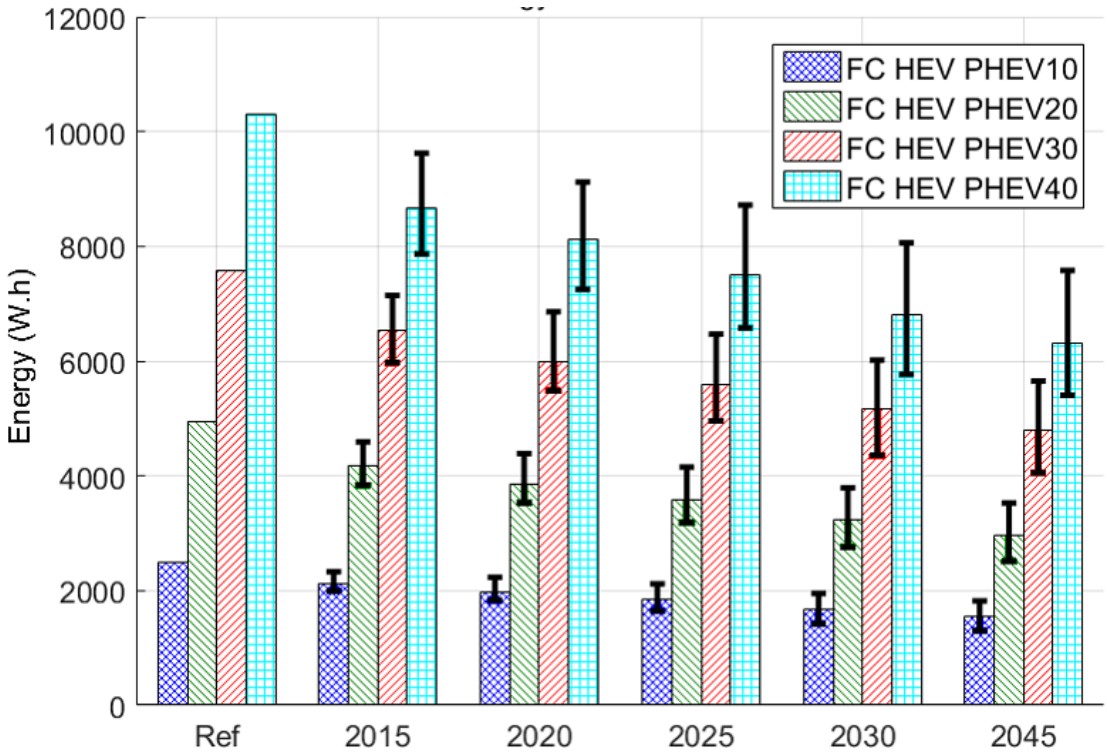


FIGURE 63 Usable battery energy for midsize fuel-cell PHEVs

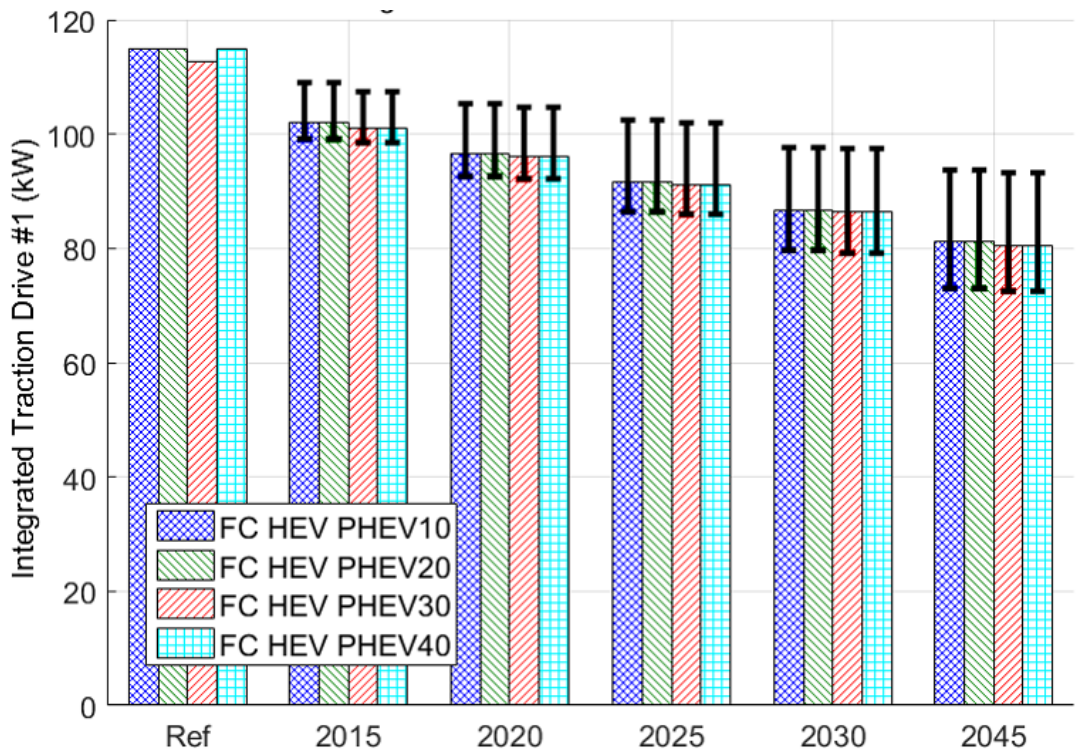


FIGURE 64 Electric-machine power for midsize fuel-cell PHEVs

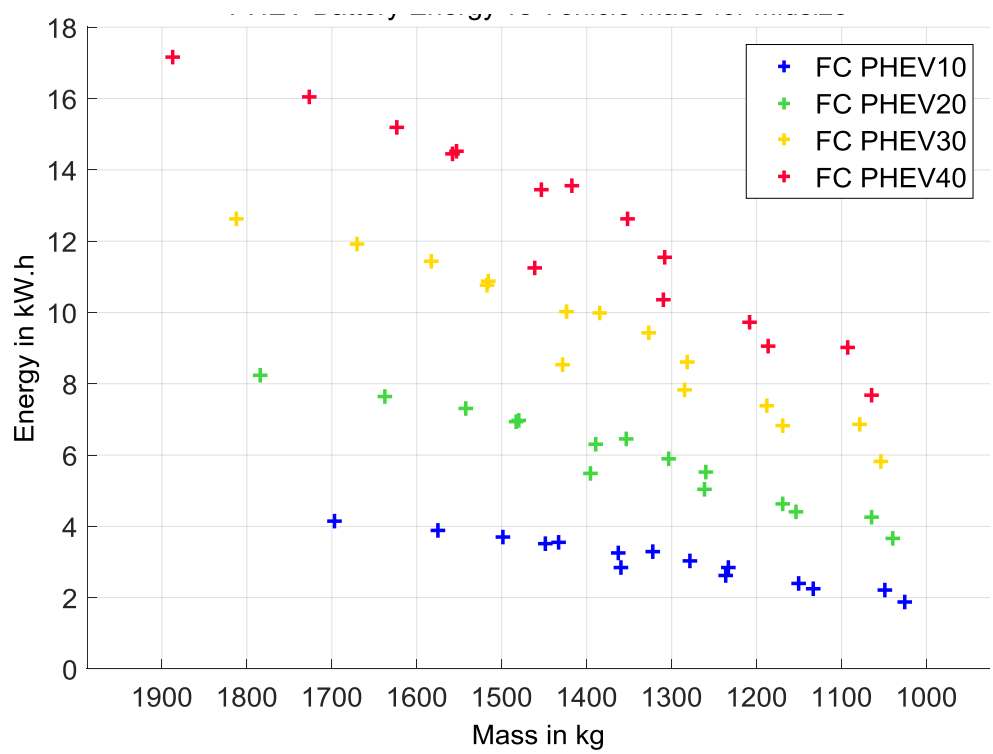


FIGURE 65 Battery energy as a function of vehicle mass for midsize fuel-cell PHEVs

6.3.6 Battery Electric Vehicle

Figures 66 and 67 show the impact of lightweighting and improved aerodynamics and tires on the electric-machine peak power for BEVs. The electric machine and the battery are close to 40 to 50% less powerful by 2045 compared with the reference case.

The decrease in usable energy for BEVs between the reference case and 2045 is cut in almost half as well (Figure 68).

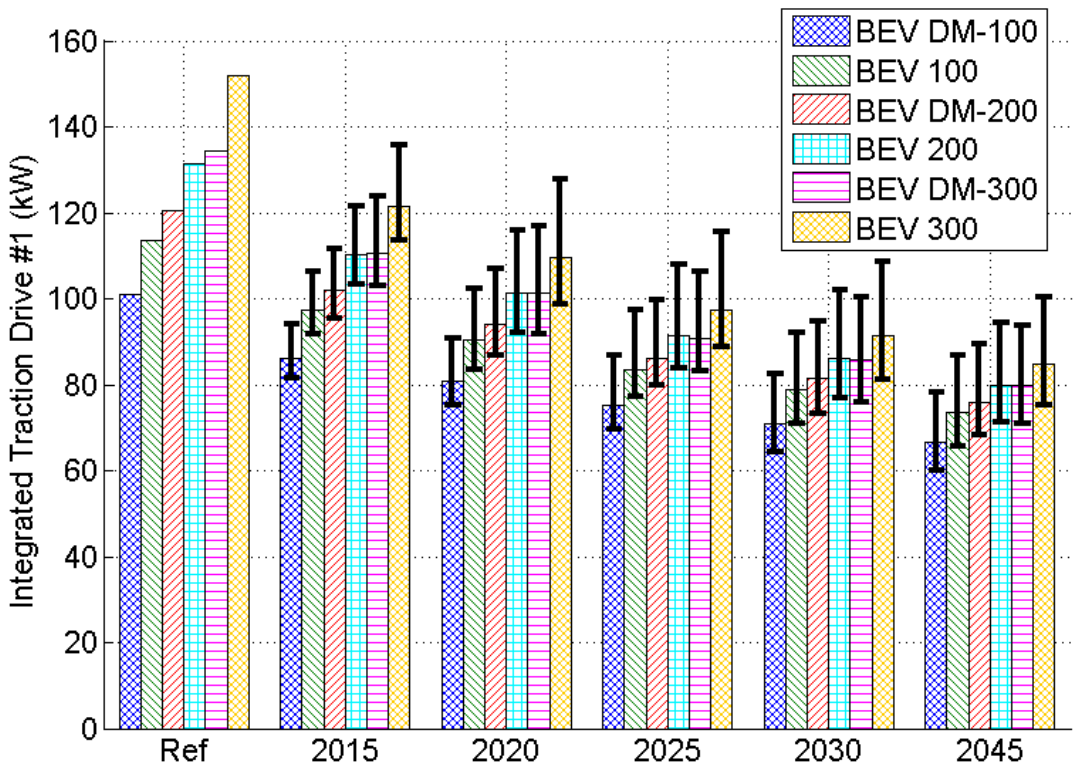


FIGURE 66 Electric-machine power for midsize BEVs

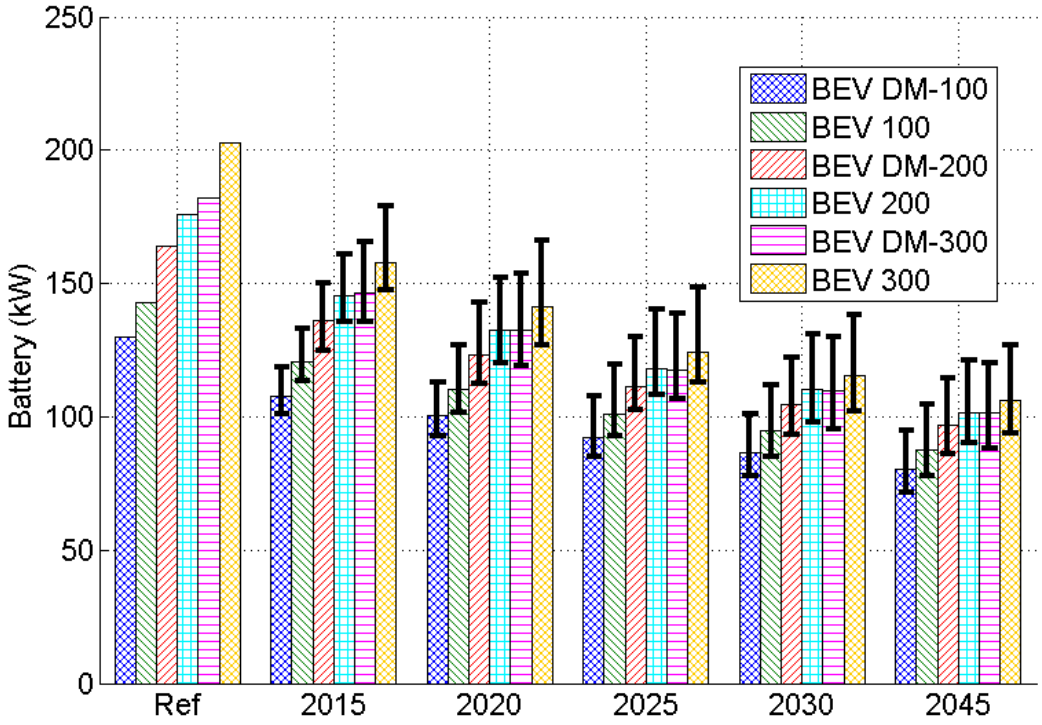


FIGURE 67 Battery power for midsize BEVs

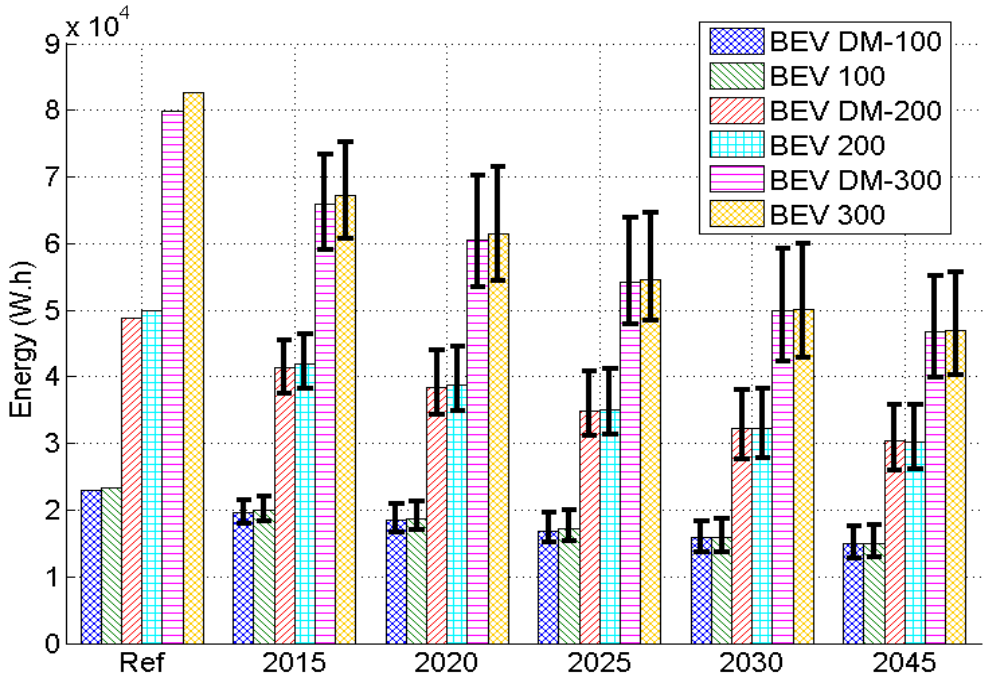


FIGURE 68 Usable battery energy for midsize BEVs

7 TEST PROCEDURE AND CONSUMPTION CALCULATIONS

All the simulations were performed under hot conditions. The cold-start penalties were assessed after the simulations, on the basis of test data collected at Argonne's APRF and a literature search. We used a two-cycle test procedure based on the UDDS and HWFET drive cycles. The calculations are consistent with the latest EPA test procedures.

Table 16 summarizes the cold-start penalties applied to the UDDS CS results for the different powertrains.

TABLE 16 Cold-start (20 °C) penalties for the different powertrain configurations (%)

Parameter	2010, Ref	2015–2045		
		Low	Med	High
Conventional	12	12	10	6
Power-split HEV	12	12	10	6
Power-split PHEV (10 and 20 in CS only)	12	12	10	6
Power-split PHEV (30 and 40 in CS only)	12	12	10	6
Fuel-cell HEV	0	0	0	0
Fuel-cell PHEV	0	0	0	0

8 SIMULATION RESULTS

The fuel-consumption results shown in this report are expressed in liters per 100 km. The reasons behind this decision came from the analysis of the data shown in Figure 73, which shows the relationship between fuel economy (expressed in mpg) and fuel consumption (expressed in gallons per 1,000 mi). There is no linear relationship between fuel consumption and fuel economy. For example, if fuel economy improves from 15 mpg to 30 mpg, approximately 37 gal of fuel per 1,000 mi is saved; whereas, if fuel economy improves from 50 mpg to 100 mpg, only 10 gal per 1,000 mi is saved. By comparing two different values of fuel consumption, one immediately knows the amount of fuel saved and thus the amounts of money and emissions saved, since they are linearly linked to the fuel consumption.

Unless otherwise specified, all the fuel-consumption results are provided for the combined drive cycle using unadjusted values based on gasoline equivalent.

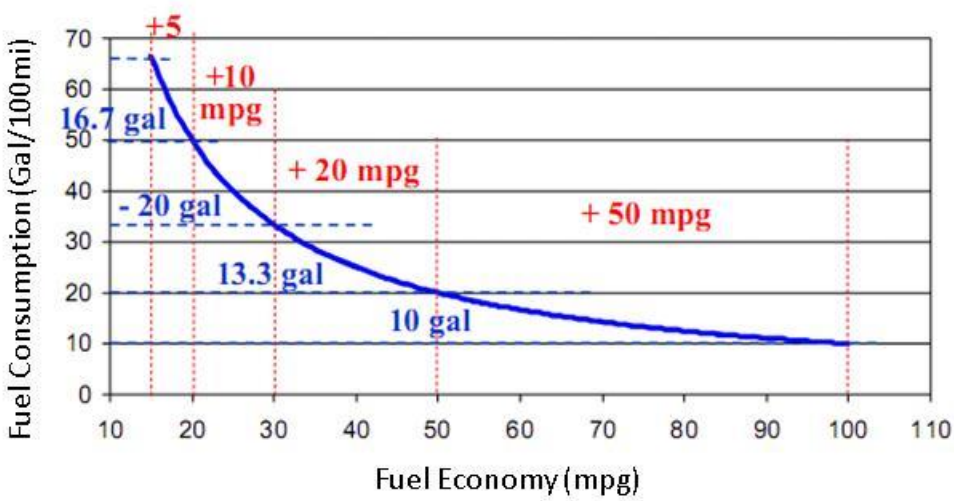


FIGURE 73 Fuel economy versus fuel consumption

8.1 EVOLUTION OF SPECIFIC POWERTRAIN CONFIGURATIONS

8.1.1 Conventional Powertrain

Figure 74 shows that fuel consumption decreases over time across fuels. Gasoline conventional midsize vehicles consume from 28% to 49% less fuel by 2045 compared with the reference case; the change is different for diesel vehicles, with a reduction in fuel consumption ranging from 24% to 46%. CNG vehicles will achieve the lowest improvements in fuel consumption between the reference case and 2045, with a decrease ranging from 17% to 38%, whereas ethanol shows the widest range of improvement, with a decrease ranging from 31% to 53%.

The CNG and gasoline vehicles have the highest fuel consumption among conventional vehicles for all timeframes. Figure 75 shows the fuel consumption relative to the reference gasoline conventional vehicle. In 2045, compared with the gasoline reference case, the ranges of improvement were as follows: gasoline engine, 28% to 49%; diesel-engine, 38% to 56%; CNG engine, 23% to 43%; and ethanol engine, 39% to 58%.

Figure 76 shows the fuel consumption relative to that of the conventional gasoline vehicle of the same year. Notice that the differences between gasoline and diesel will tend to slightly decrease in the future. Even if the fuel consumption of the CNG engine improves in the future (Figure 76), it will still remain less efficient than any other fuel on a volumetric basis from 2015 to 2045.

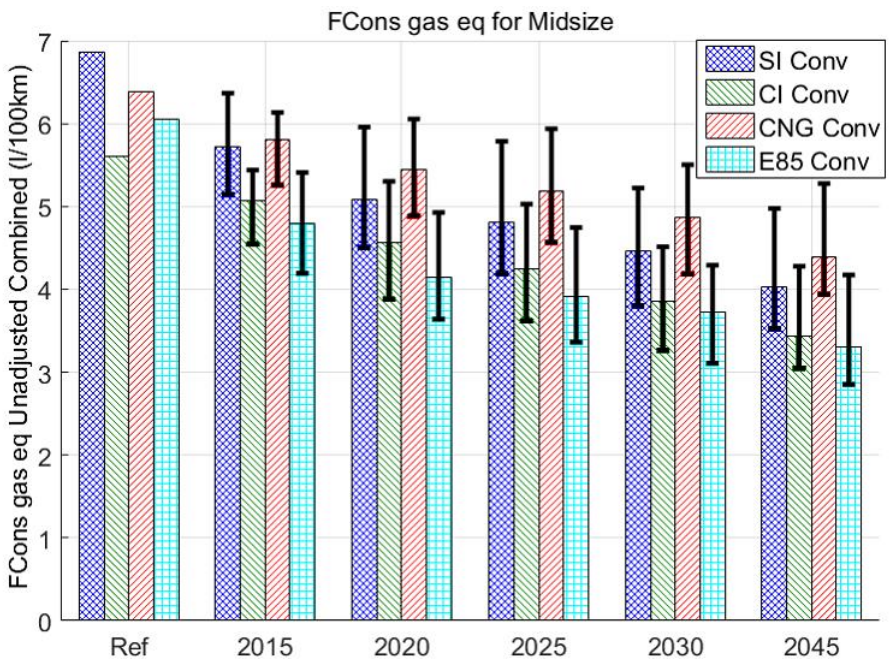


FIGURE 74 Gasoline-equivalent fuel consumption for conventional midsize cars

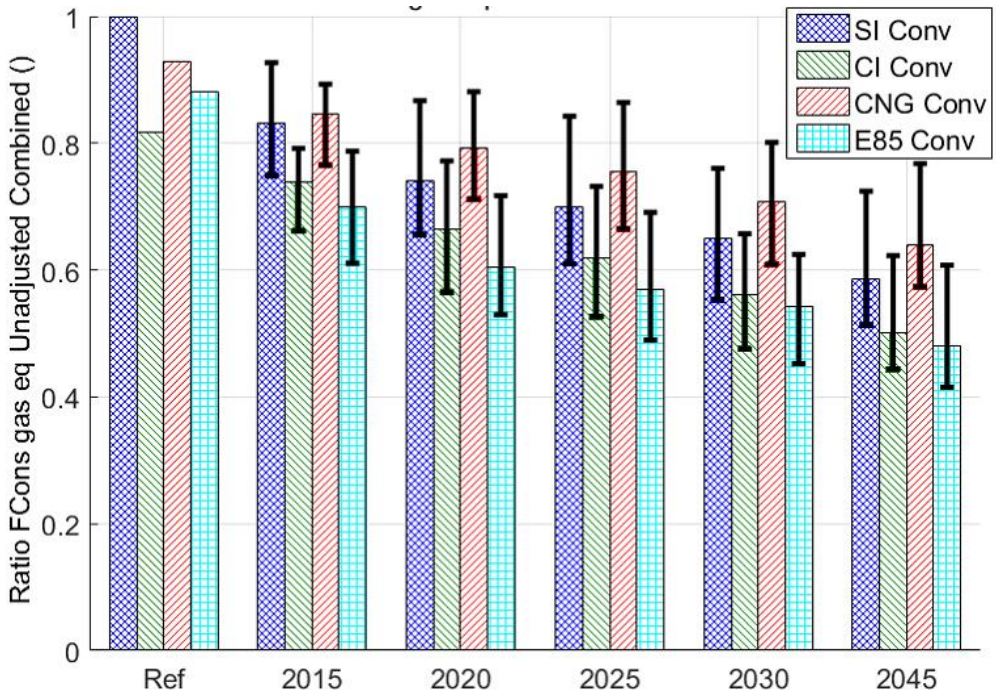


FIGURE 75 Gasoline-equivalent fuel consumption for conventional midsize cars compared with reference conventional gasoline vehicle

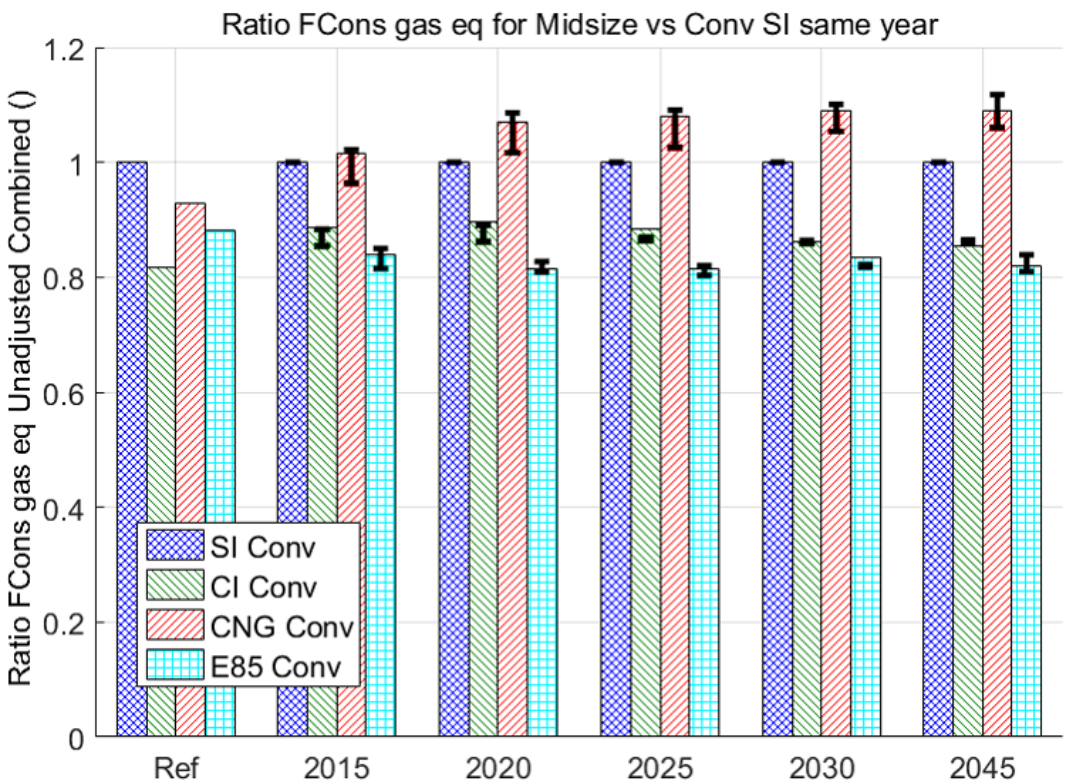


FIGURE 76 Gasoline-equivalent fuel consumption for conventional midsize cars compared with same-year conventional gasoline vehicle

8.1.2 HEV Engine

Figure 77 shows that fuel consumption for HEVs is expected to decrease significantly over time.

Figure 78 shows the fuel consumption compared with the HEV reference gasoline vehicle. The ratio between all fuel and gasoline reaches 0.5 by 2045 in the high-uncertainty case, which shows the dramatic improvements that can be expected from power-split vehicles (similarly to conventional).

Figure 79 shows the fuel-consumption ratios for HEVs with various fuels compared with the gasoline HEV of the same year. The results show fluctuations throughout the years, but the tendencies are not flipped: ratios above 1 stay above 1, and ratios below 1 stay below 1.

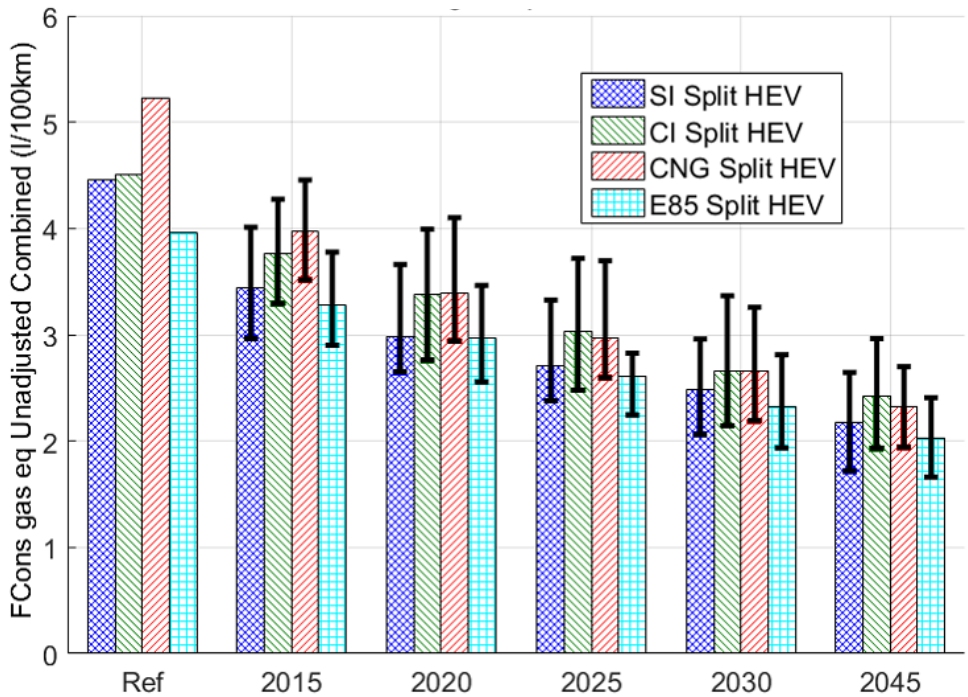


FIGURE 77 Gasoline-equivalent fuel consumption for midsize split HEVs

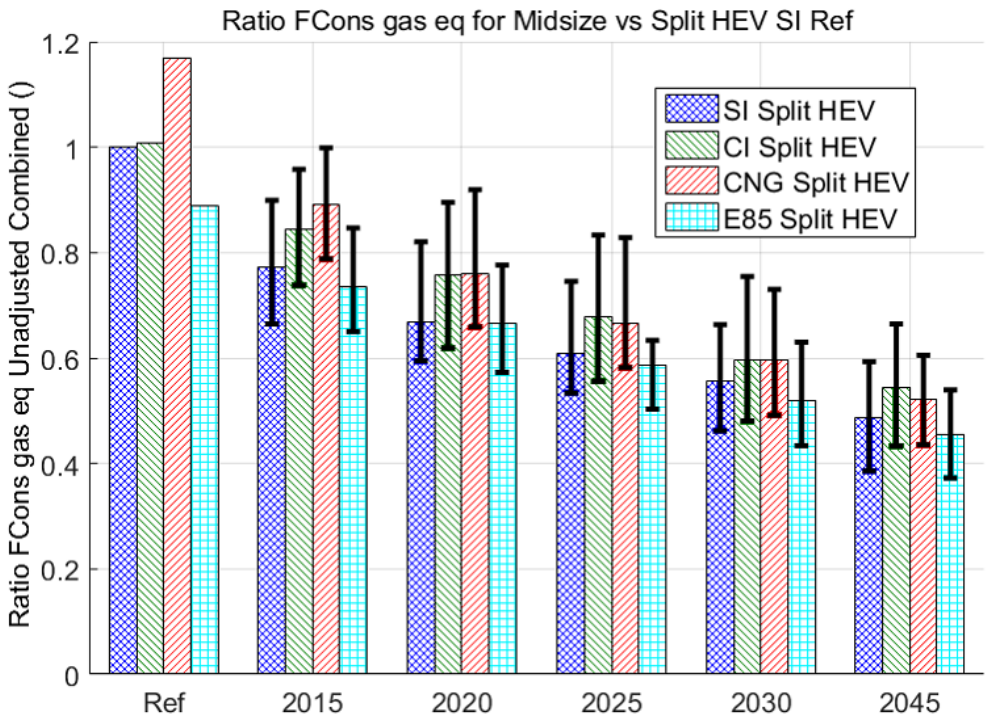


FIGURE 78 Gasoline-equivalent fuel consumption of midsize split HEVs compared with reference gasoline split HEV

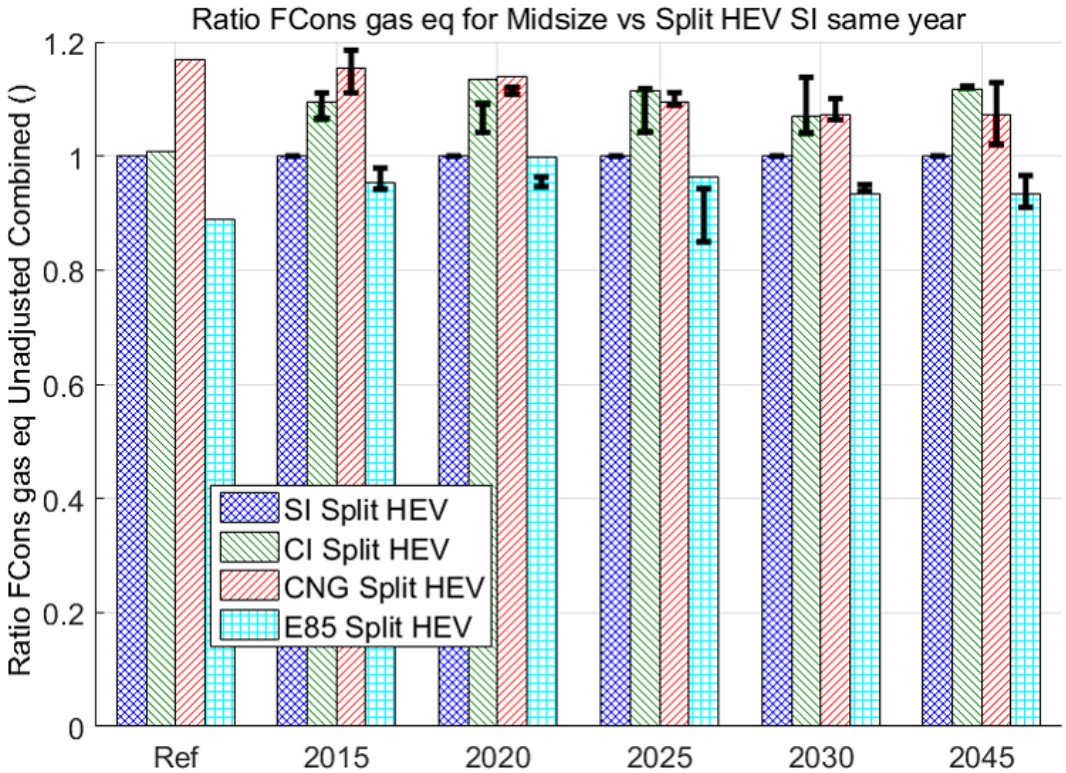


FIGURE 79 Gasoline-equivalent fuel consumption for split-HEV midsize cars compared with same-year, same-case gasoline HEVs

8.1.3 PHEV Engine

The fuel-consumption evolution for power-split PHEVs is similar to that for power-split HEVs. The CNG vehicles always have the highest fuel consumption.

For the same fuel, the fuel consumption decreases with higher AER. The bigger the battery, the less fuel is consumed. However, there is no clear relationship between battery size and specific fuel-consumption improvement. For instance, between 2010 and 2045, the fuel-consumption improvement of gasoline engines is about 42% for PHEV10, 44% for PHEV20, 33% for PHEV30, and 34% for PHEV40. These variations do not show a trend related to battery size and improvement over the years. Data for PHEV10s and PHEV20s are shown in Figure 80, and for PHEV30s and 40s in Figure 81.

As in the HEV case, gasoline shows the most improvement of any fuel between 2010 and 2045.

Figure 82 shows the fuel consumption for the PHEV10 and PHEV20 compared with the same-year PHEV gasoline vehicle.

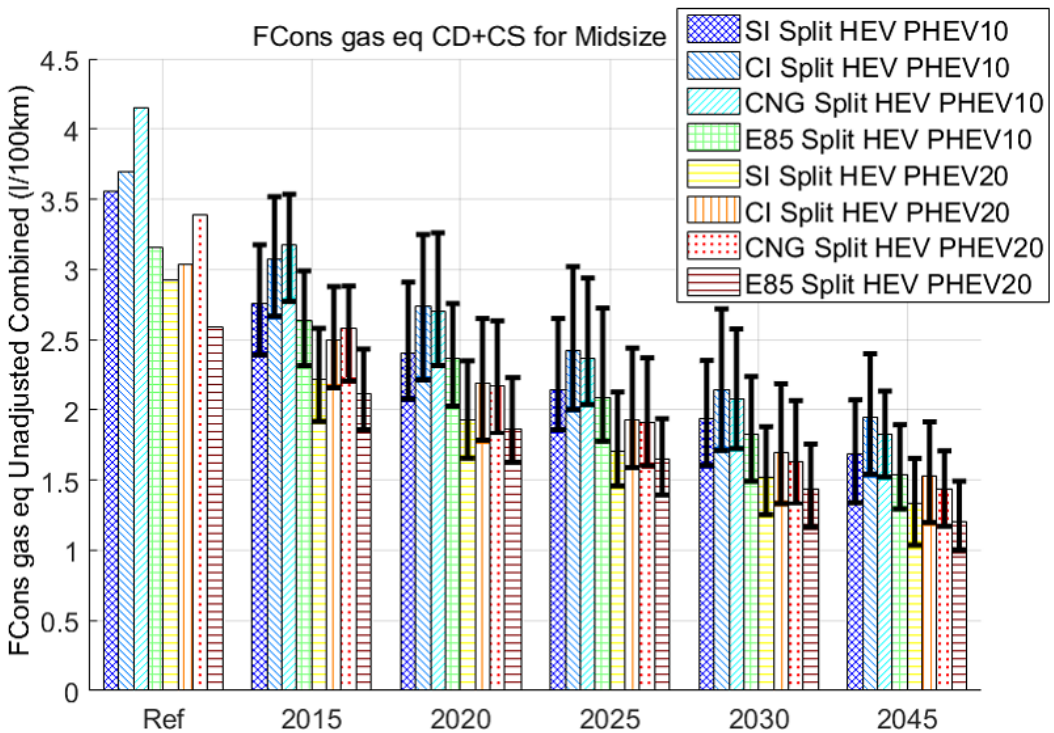


FIGURE 80 Gasoline-equivalent fuel consumption for midsize split PHEV10s and PHEV20s (all fuel-consumption values are CD+CS)

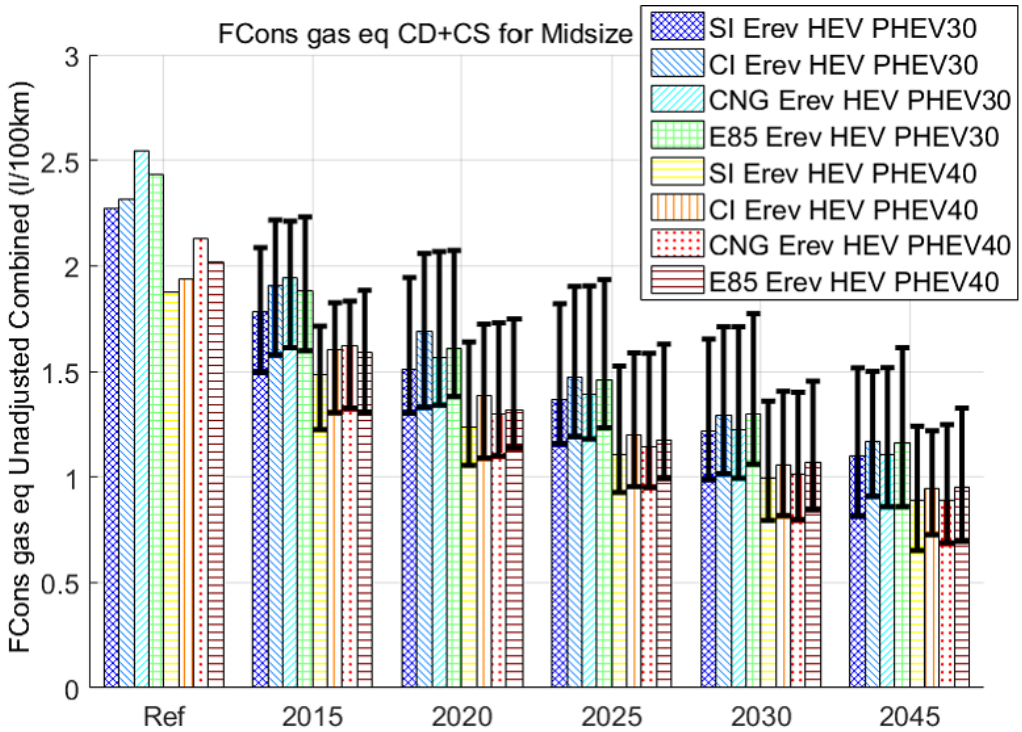


FIGURE 81 Gasoline-equivalent fuel consumption for midsize split PHEV30s and PHEV40s (all fuel-consumption values are CD+CS)

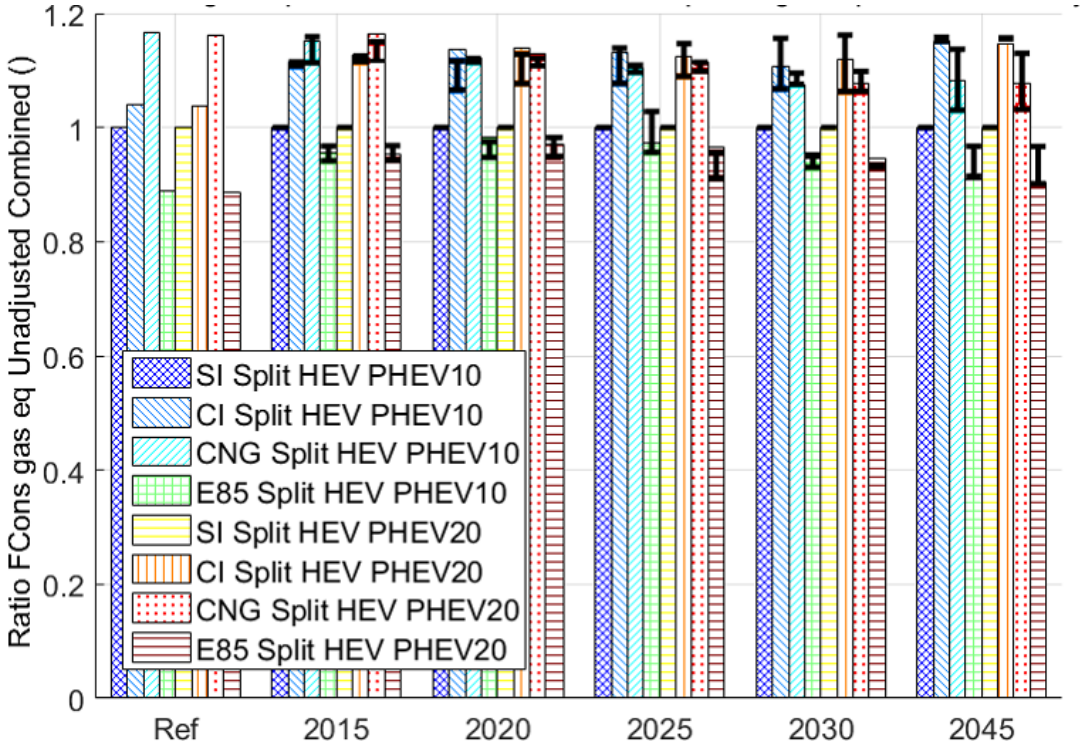


FIGURE 82 Gasoline-equivalent fuel consumption for split PHEV10 and PHEV20 midsize cars compared with same-year, same-case gasoline PHEVs with matching AER (all fuel-consumption values are CD+CS)

Figure 83 shows the fuel-consumption ratios for PHEV10s and PHEV20s compared with the reference PHEV gasoline vehicle.

Figure 84 shows the fuel consumption for PHEV30s and PHEV40s compared with the same-year gasoline PHEV. Note that the fuel-consumption ratios versus the same-year gasoline PHEV remain flat across years (Figure 85).

Figure 86 shows that there is a linear relationship between vehicle mass and electrical consumption: the bigger the vehicle, the higher the electrical consumption. This observation is consistent with the fuel-consumption increase with vehicle mass. Because of the different energy density assumptions used for split vehicles and E-REVs, the figure shows a separation of the two configurations' electrical consumption.

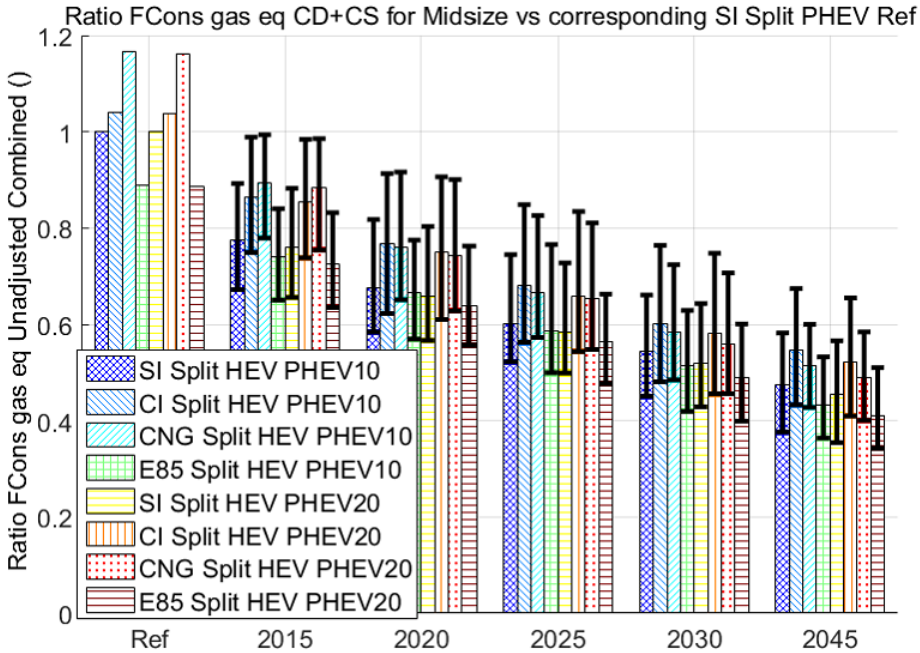


FIGURE 83 Gasoline-equivalent fuel consumption for split PHEV10 and PHEV20 midsize cars compared with reference gasoline PHEVs (all fuel-consumption values are CD+CS)

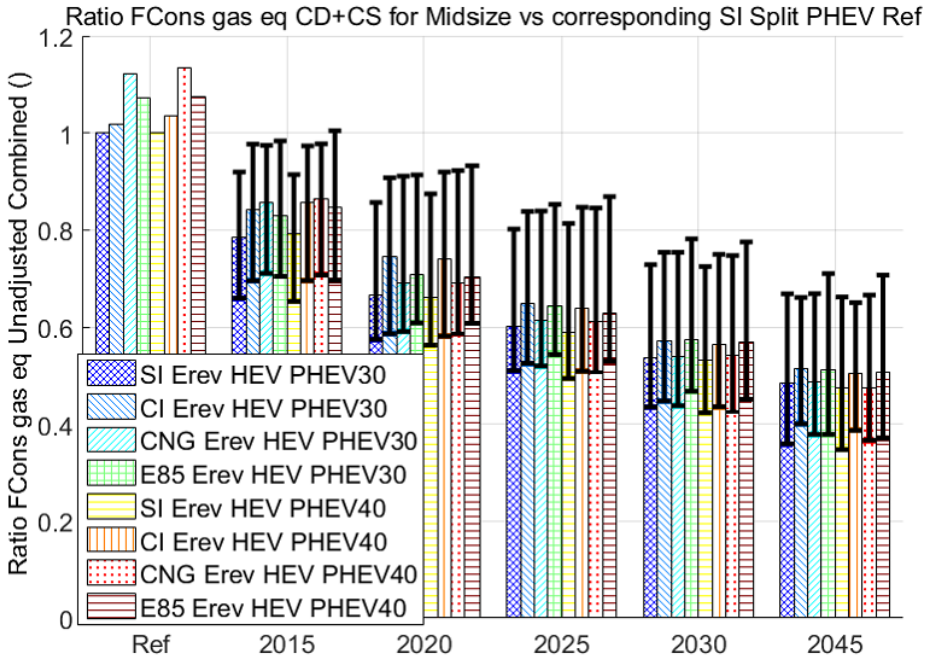


FIGURE 84 Gasoline-equivalent fuel consumption for split PHEV30 and PHEV40 midsize cars compared with reference gasoline PHEVs (all fuel-consumption values are CD+CS)

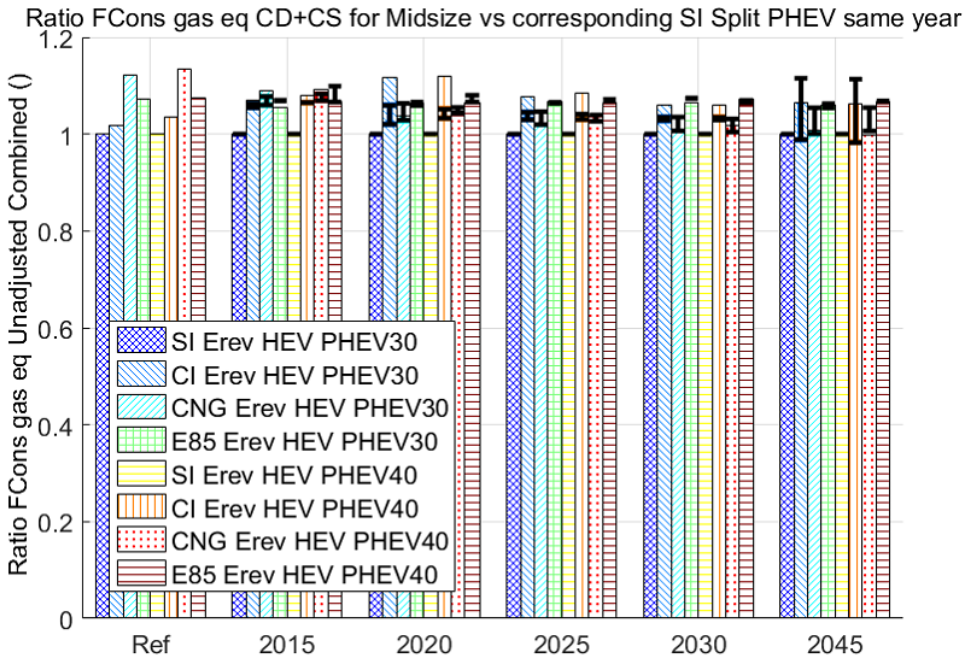


FIGURE 85 Gasoline-equivalent fuel consumption for split PHEV30 and PHEV40 midsize cars compared with same-year, same-case gasoline PHEVs with matching AER (all fuel-consumption values are CD+CS)

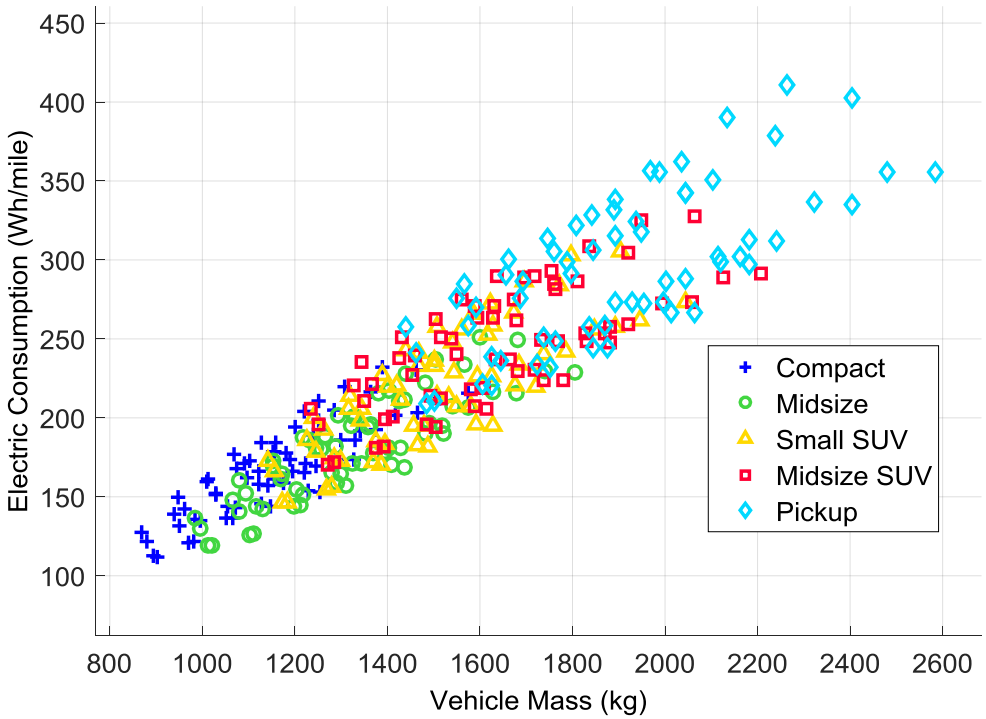


FIGURE 86 Electric consumption compared with vehicle mass in CD+CS mode for gasoline split PHEVs

8.1.4 Fuel-Cell HEV

The fuel-cell HEV fuel consumption (Figures 87 and 88) decreases from 2010 to 2045. In 2045, the fuel consumption is from 35% to 56% lower than in the reference case.

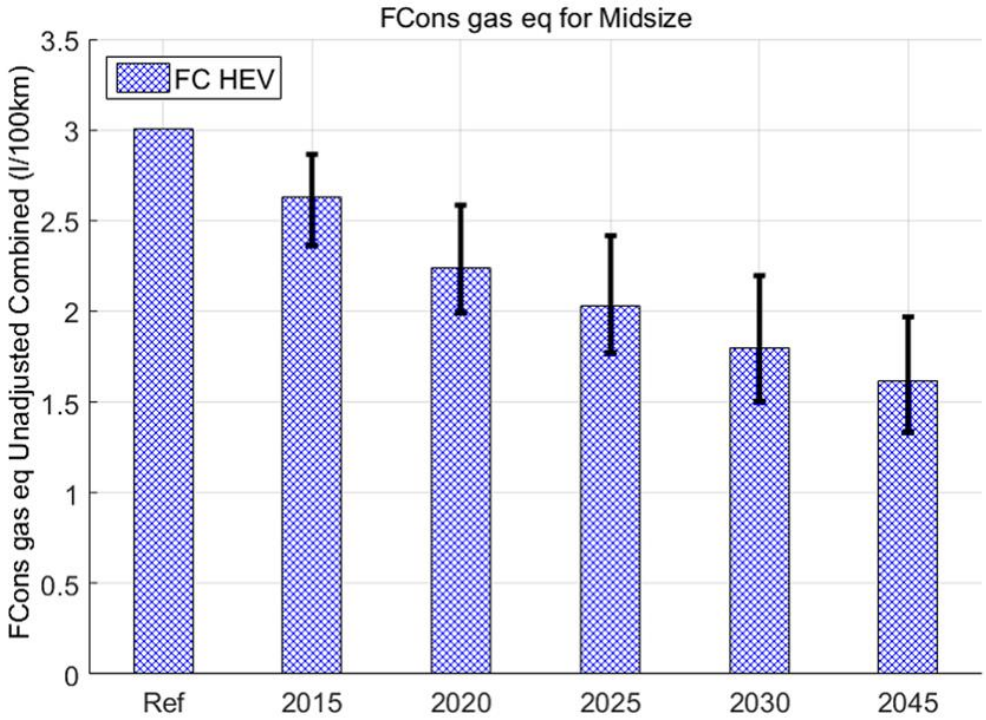


FIGURE 87 Gasoline-equivalent fuel consumption for midsize fuel-cell HEVs

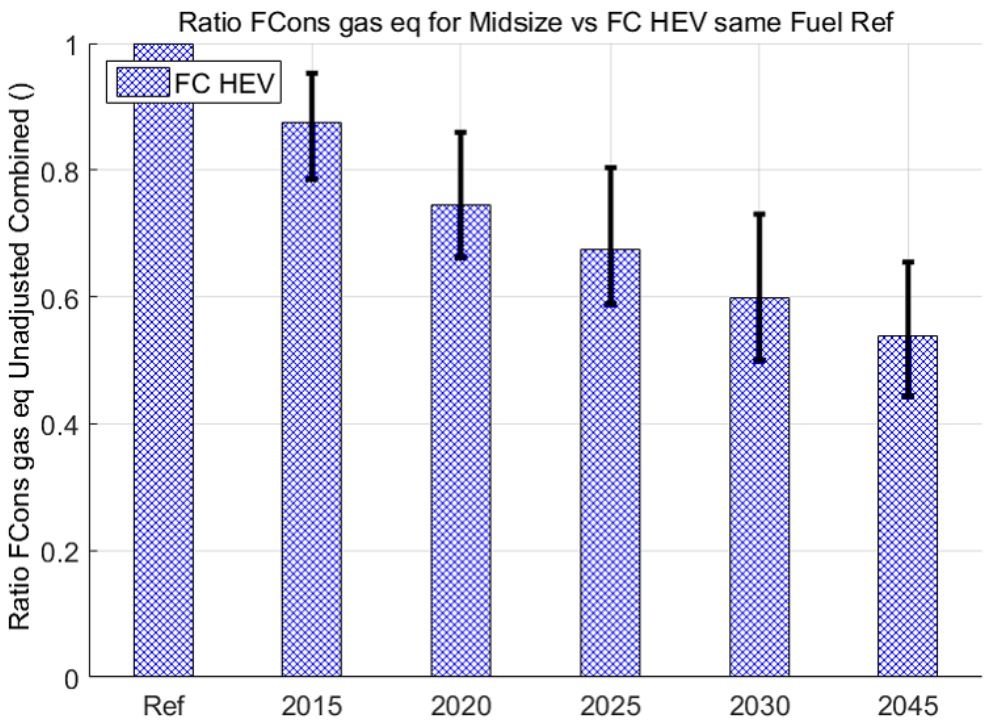


FIGURE 88 Gasoline-equivalent fuel consumption compared with reference midsize fuel-cell HEVs

8.1.5 Fuel-Cell PHEV

For fuel-cell PHEVs, the fuel consumption decreases slowly (Figures 89 and 90) as the AER goes from one range to the next higher range, for the same reasons discussed for power-split PHEVs. From 2010 to 2045, the consumption decreases by 35% to 57% for all the AERs. Note that this rate of change coincides with the decrease of fuel-cell HEV fuel consumption.

Figure 91 shows that electrical consumption also decreases considerably from 2010 to 2045. Initial consumption levels increase within the AER for any given year.

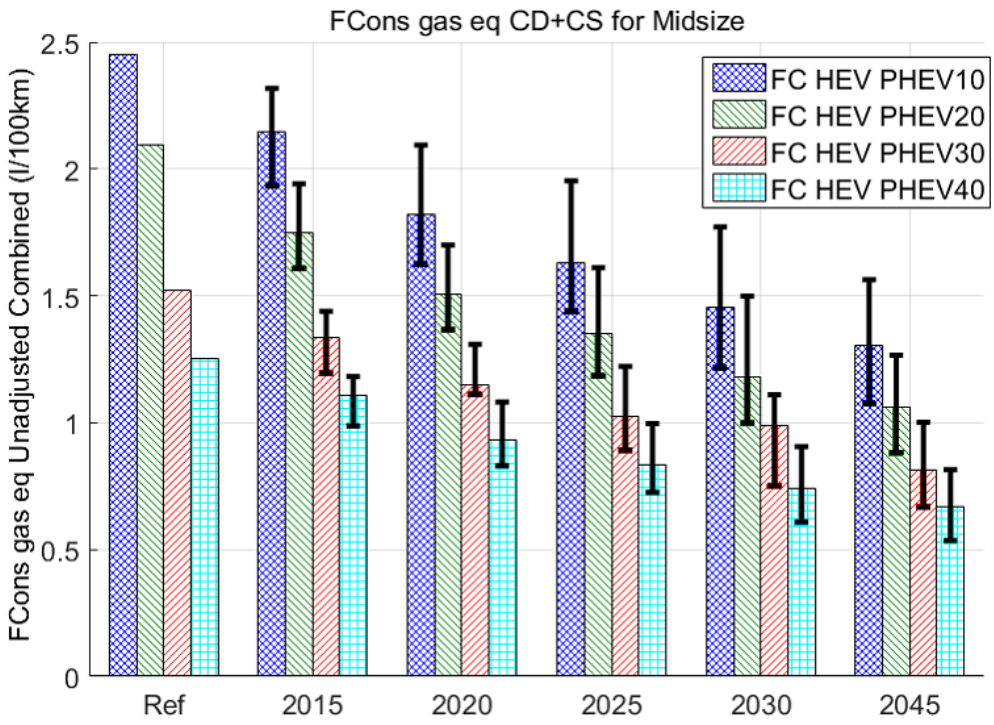


FIGURE 89 Gasoline-equivalent fuel consumption for midsize fuel-cell PHEVs (all fuel-consumption values are CD+CS)

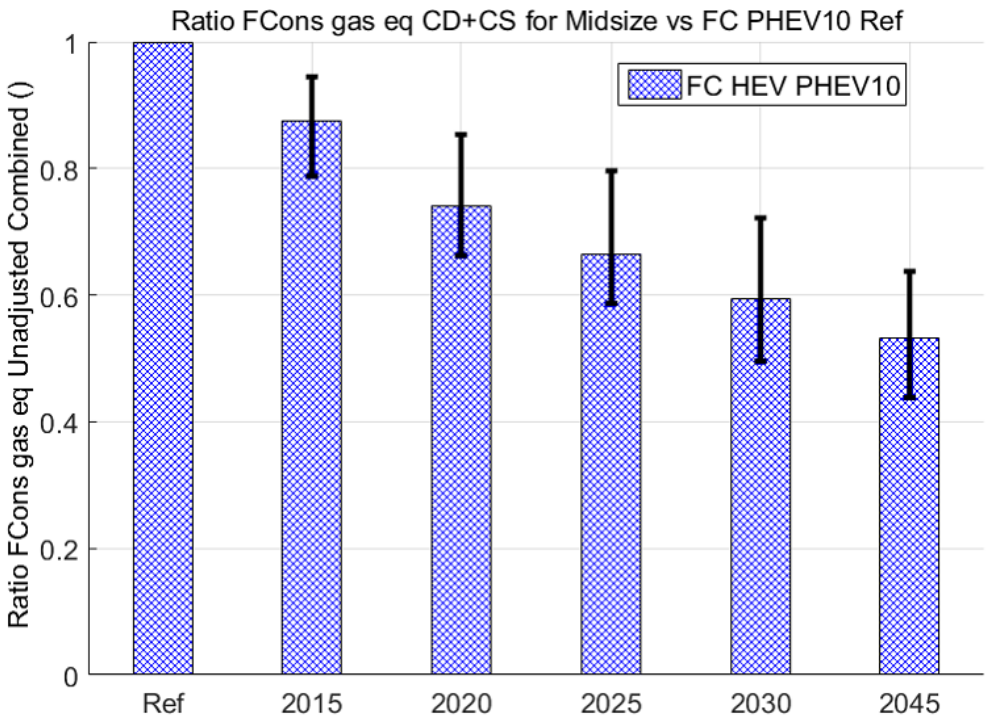


FIGURE 90 Gasoline-equivalent fuel consumption for midsize fuel-cell PHEV10s compared with reference PHEV10s

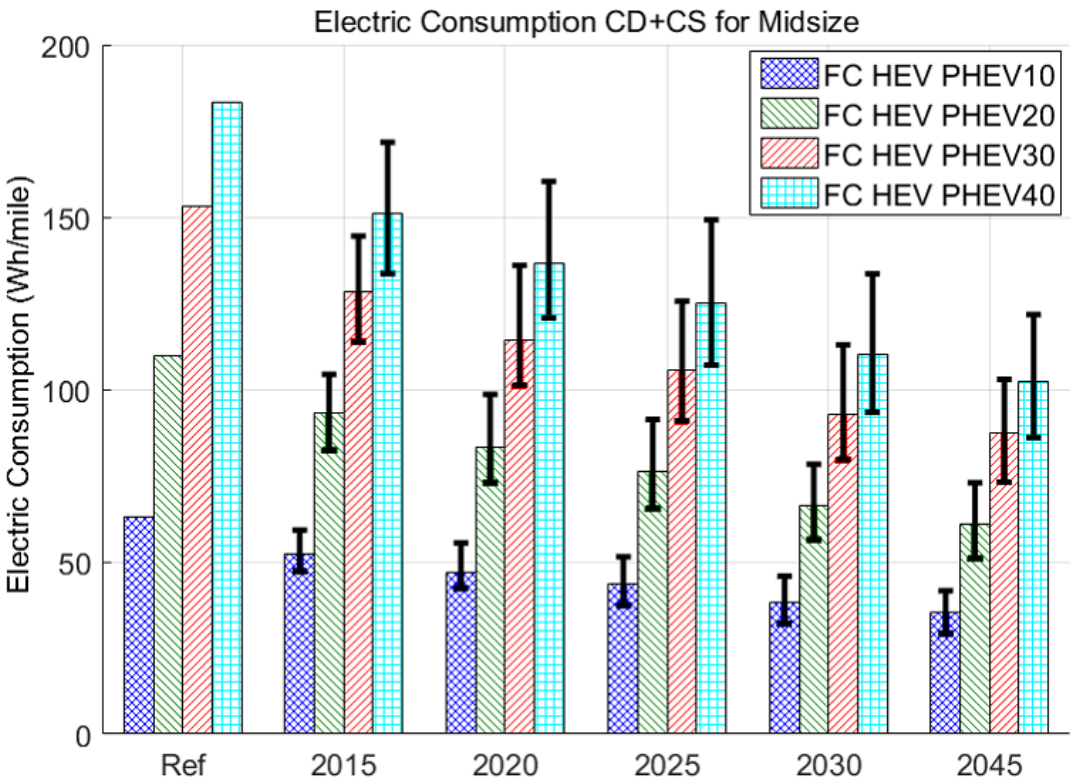


FIGURE 91 Electrical consumption in CD+CS mode for midsize fuel-cell PHEVs

8.1.6 Electric Vehicles

For BEVs, the results are given in terms of electrical consumption for the two drive cycles used in the simulations: UDDS and HWFET. The combination of lightweighting and component improvements leads to a significant decrease in electrical consumption over time.

The values, expressed in watt-hours per mile, represent the average energy provided by the battery to drive the vehicle for 1 mi. As shown in Figure 92, the HWFET electrical consumption is consistently higher than for a UDDS cycle. This can be explained by looking at the two drive-cycle curves and the energy recoverable by regenerative braking. The UDDS cycle has many strong and steep braking periods, which offer ample opportunities to recover some energy through braking. On the other hand, the HWFET cycle features more stable speeds and only limited braking times. Consequently, the battery recuperates more energy through regenerative braking during a UDDS cycle than during a HWFET cycle.

Figure 93 shows the strong relationship between vehicle lightweighting and electrical consumption.

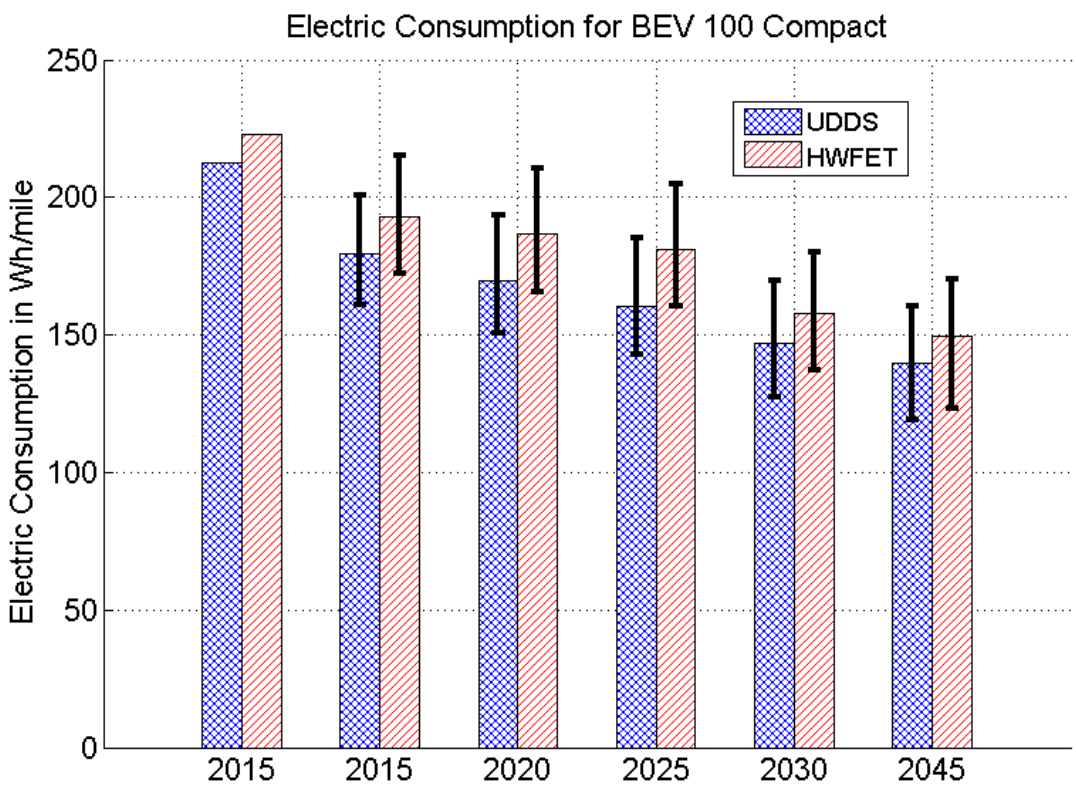


FIGURE 92 Electrical consumption by midsize BEV100s operating on UDDS and HWFET cycles

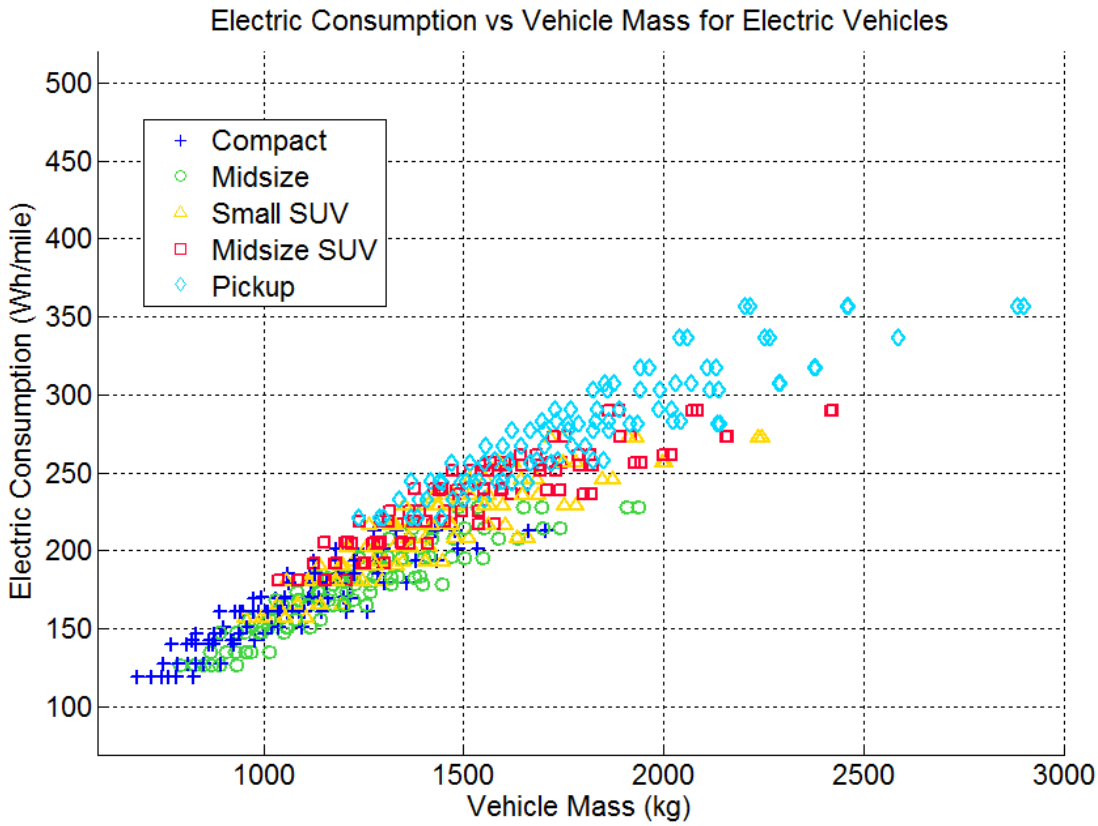


FIGURE 93 Electrical consumption versus vehicle mass by vehicle class for all range BEVs

8.2 EVOLUTION OF HEV ENGINES

8.2.1 HEV versus Conventional Engine

The comparison between power-split HEVs and conventional gasoline vehicles (same year, same case) in Figure 94 shows that the ratios stay fairly constant until 2020 but slowly decrease afterwards. Indeed, the power-split midsize vehicle consumes between 25% and 45% less fuel than the conventional gasoline vehicle in 2010 to 2020 versus 40% to 50% by 2045. After 2030, the introduction of micro hybrid vehicles does not seem to give conventional vehicles (becoming start/stop systems) an advantage over HEVs.

In Figure 95, the reference case is the same-year and same-fuel conventional vehicle.

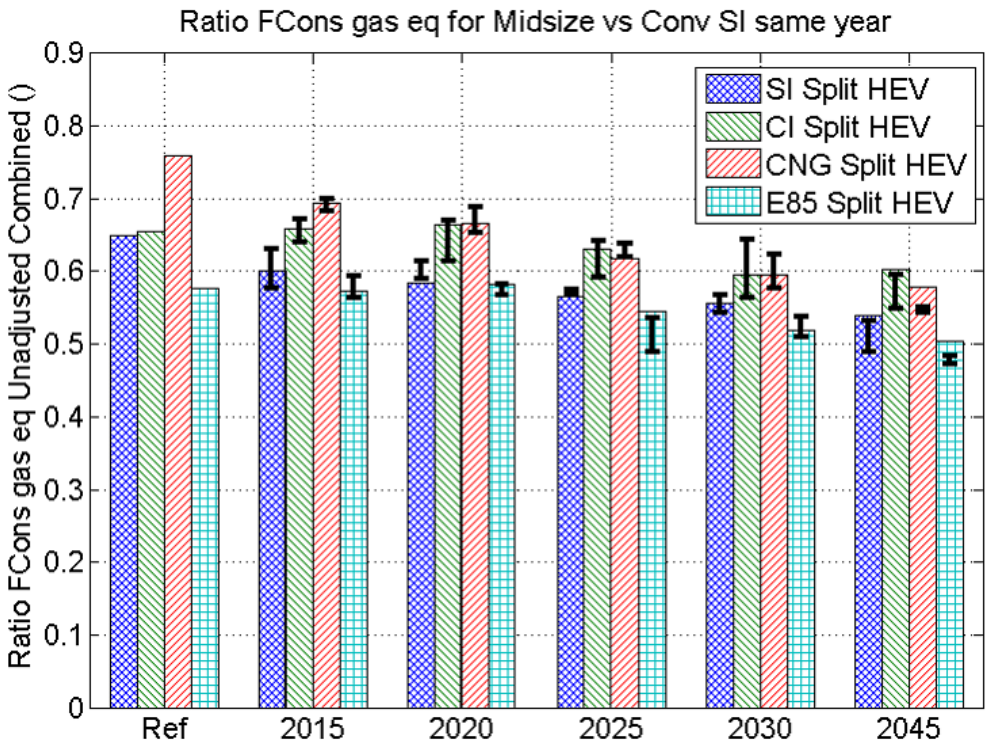


FIGURE 94 Gasoline-equivalent fuel consumption for midsize power-split HEVs compared with same-year, same-case conventional gasoline vehicles

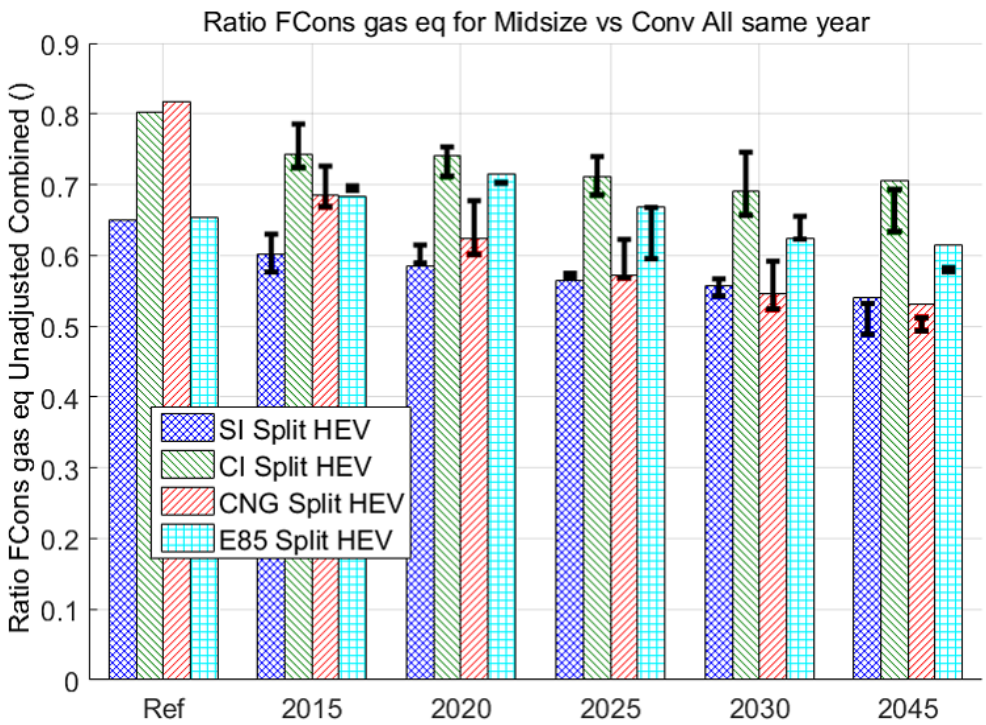


FIGURE 95 Gasoline-equivalent fuel consumption for midsize power-split HEVs compared with same-fuel, same-year conventional midsize vehicles

8.2.2 Engine HEV vs. Fuel-Cell HEV

The fuel-consumption ratios for all types of power-split HEVs versus fuel-cell HEVs (Figure 96) are higher than 1, showing that fuel-cell technology offers consistently lower fuel consumption than power-split HEV technology. However, the ratios vary over time, and it is pertinent to study the evolution for each fuel. In the reference case, this vehicle consumes nearly 48% more fuel than a fuel-cell HEV; in 2045, however, this difference is reduced to 29% (gasoline HEV).

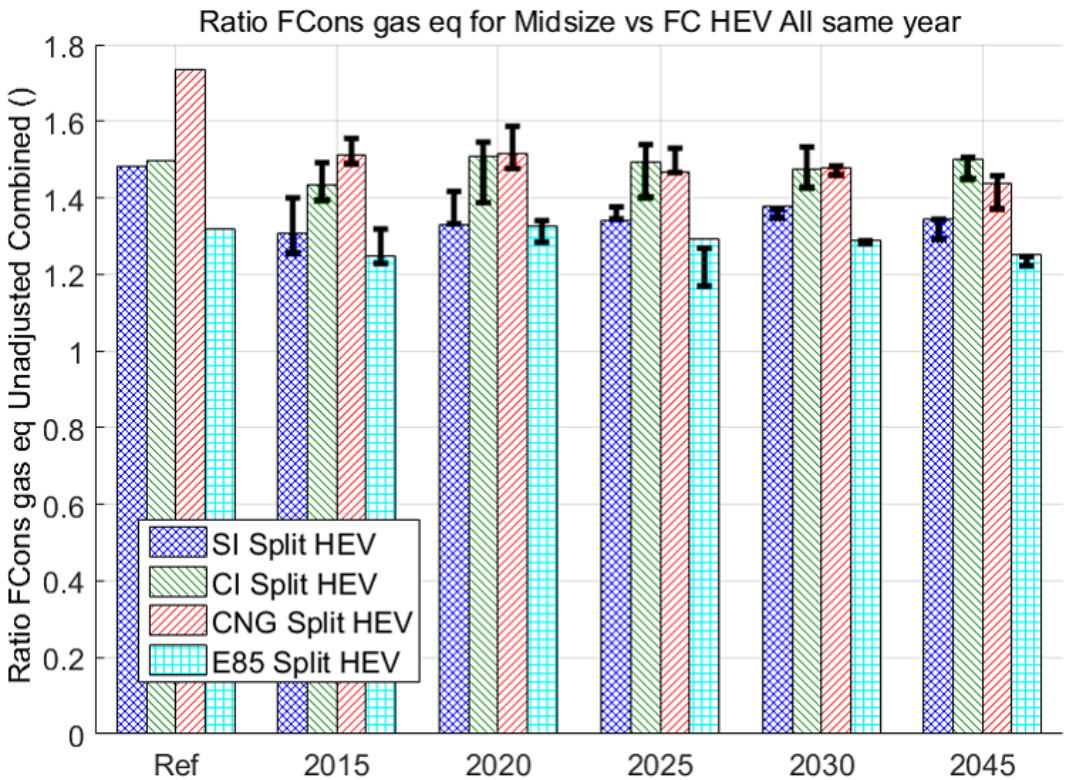


FIGURE 96 Gasoline-equivalent fuel consumption for midsize power-split HEVs compared with same-year, same-case midsize fuel-cell HEVs

8.3 EVOLUTION OF HYDROGEN-FUELED VEHICLES

8.3.1 Fuel-Cell HEV versus Gasoline Engine

In the reference case, the fuel-cell HEVs consume about 56% less fuel than conventional gasoline vehicles. This difference in fuel consumption increases to 60% to 63% in 2045 (Figure 97), indicating that the gasoline conventional vehicle will not improve its fuel consumption as fast as the fuel-cell HEV.

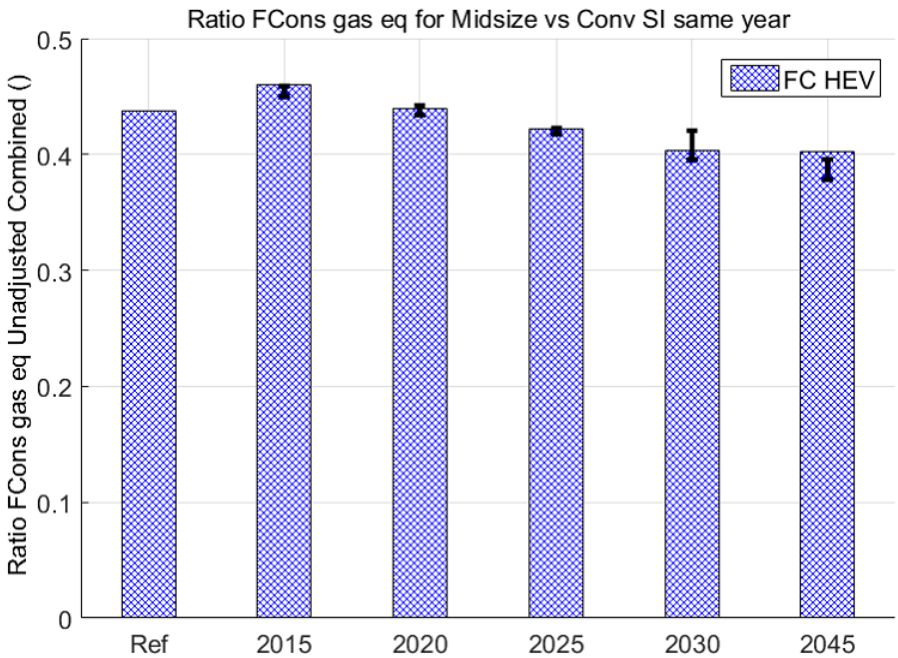


FIGURE 97 Gasoline-equivalent fuel consumption for midsize fuel-cell HEVs compared with same-year, same-case midsize gasoline vehicles

In contrast, Figure 98 shows that in the reference case, fuel-cell HEVs consume about 56% less fuel than gasoline HEVs. This difference in fuel consumption increases in the 2045 timeframe to reach ratios of 0.3 to 0.2, or a difference of 70% to 80%.

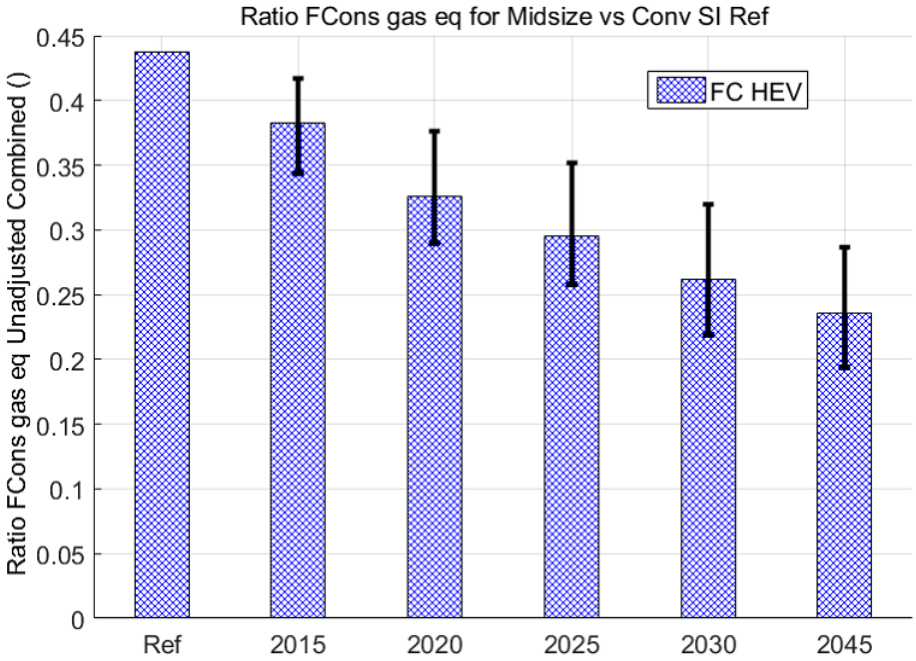


FIGURE 98 Gasoline-equivalent fuel consumption for midsize fuel-cell HEVs compared with reference case midsize gasoline split HEVs

9 VEHICLE FUEL CONSUMPTION VERSUS MANUFACTURING COST RESULTS

Along with the 3 levels of technology uncertainty, 3 levels of cost uncertainty have been computed (low cost, average cost and high cost. Only low-low, med-med, high-high tech/cost uncertainties are represented in the following figures. Also, all costs reported in this section are manufacturing costs.

9.1 EVOLUTION OF SPECIFIC POWERTRAIN CONFIGURATIONS

9.1.1 Conventional

Figure 99 shows manufacturing costs for conventional midsize vehicles. All vehicle prices increase from 2010 to 2045. The increase is due to several factors, including lightweighting (the decrease in vehicle body weight by 2045 is accompanied by material cost increases, due to increase use of aluminum or carbon fiber) and advanced component technologies.

Figure 100 shows the manufacturing cost of conventional midsize diesel, CNG, and ethanol vehicles compared with same-year conventional midsize gasoline vehicles.

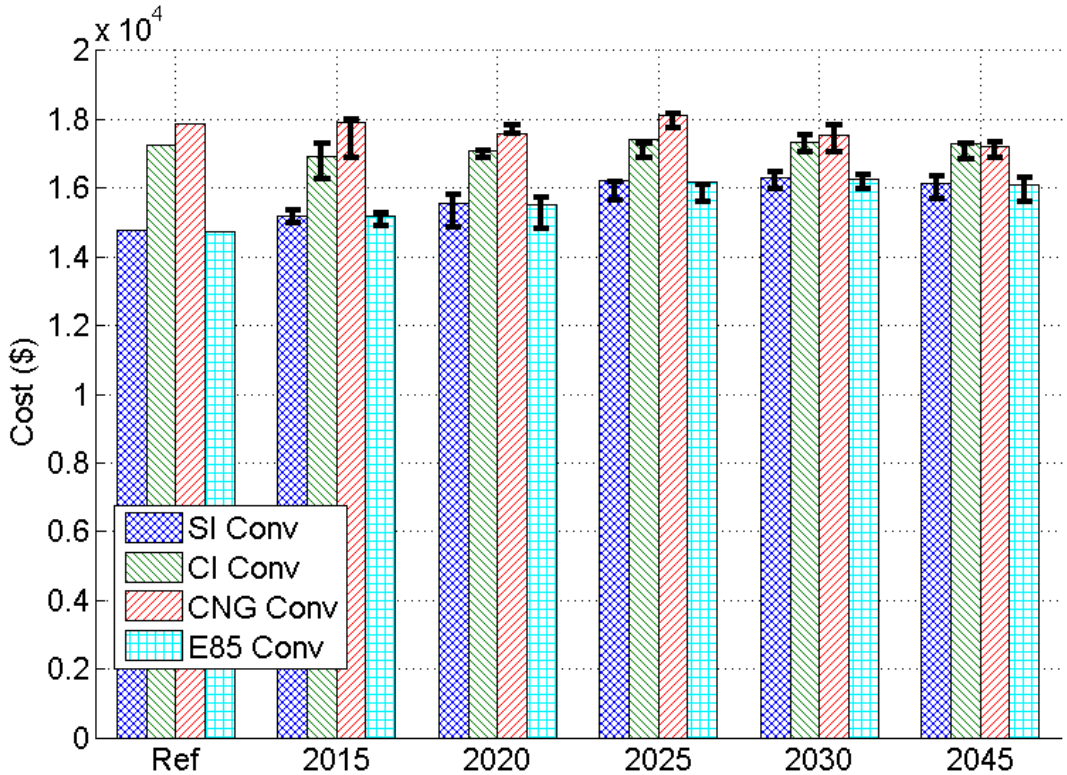


FIGURE 99 Manufacturing costs of conventional vehicles

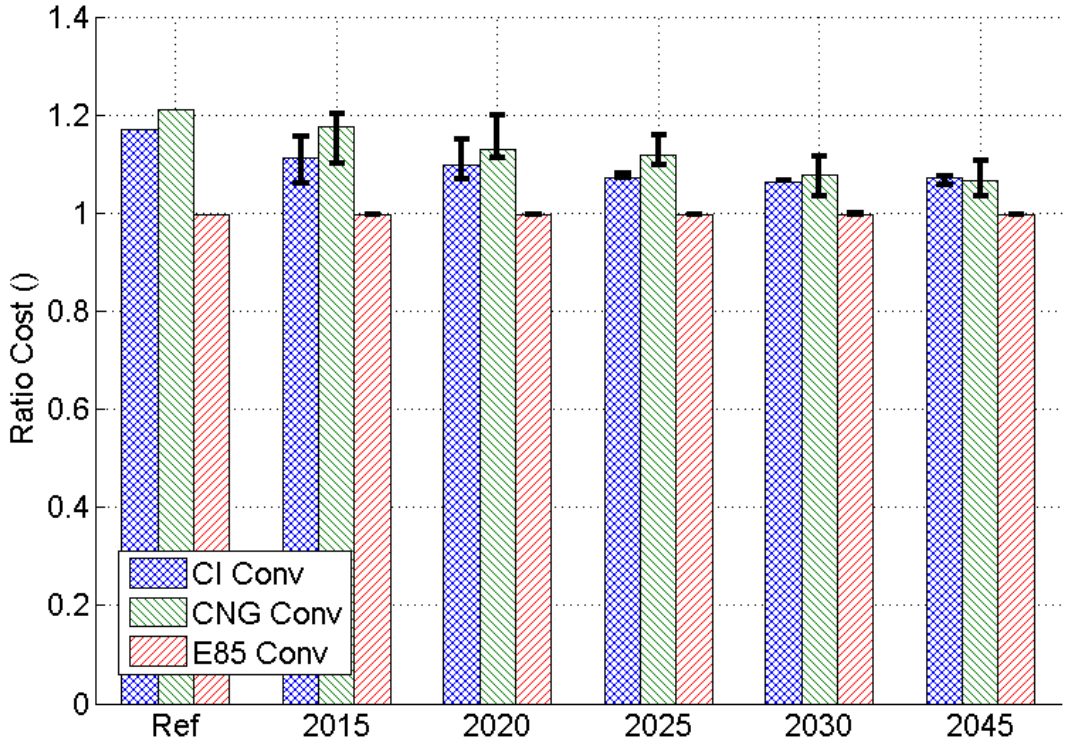


FIGURE 100 Manufacturing costs of diesel, CNG, and ethanol conventional midsize cars compared with same-year gasoline conventional midsize cars

9.1.2 Engine HEVs

Figure 101 shows the vehicle manufacturing costs for the power-split HEVs. The gasoline power-split HEV is the cheapest vehicle among all the HEVs (along with ethanol). Figure 102 shows that overall, the diesel HEV is between 15% and 40% more expensive than the gasoline HEV. This difference, however, tends to decrease after 2010. From 2010 on, the vehicles' cost ratio decreases, reaching almost 1.1 in 2045. CNG vehicles see similar trends.

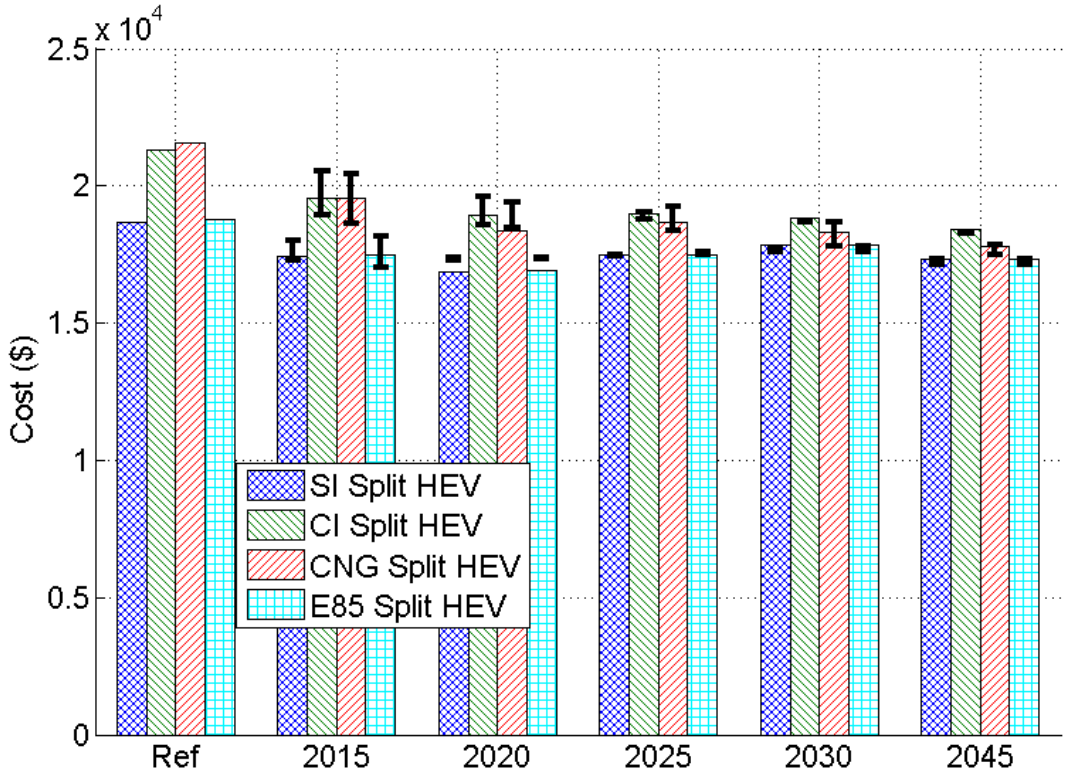


FIGURE 101 Manufacturing costs of midsize HEVs

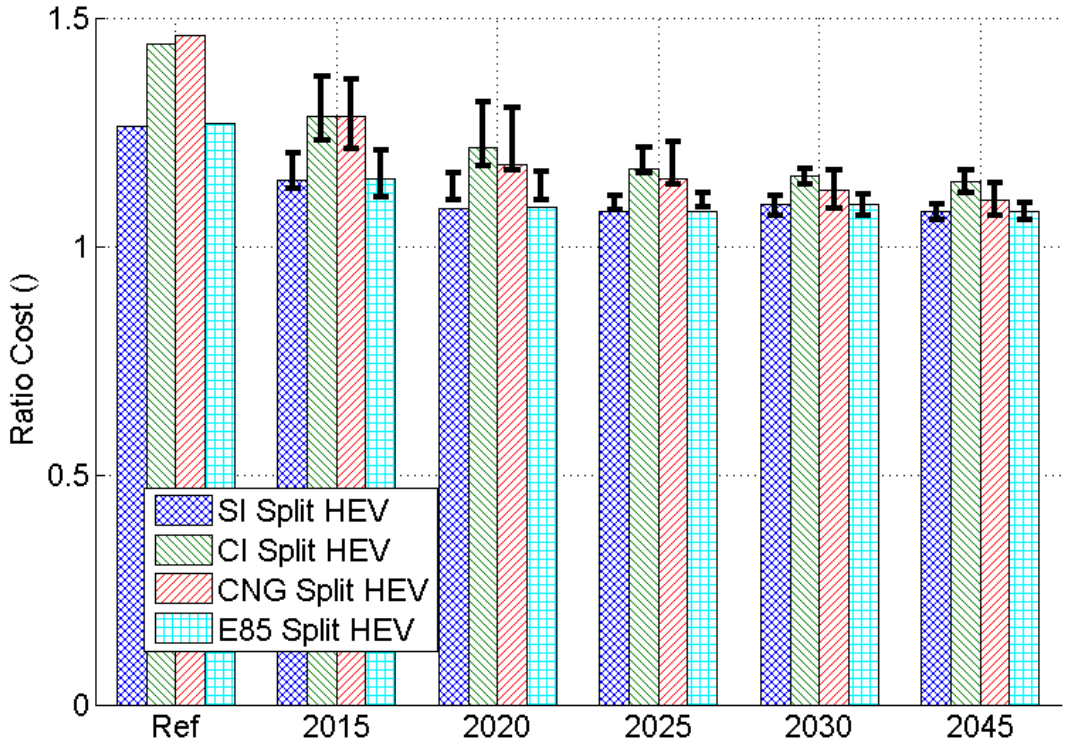


FIGURE 102 Manufacturing costs of midsize HEVs compared with same-year conventional gasoline vehicles

9.1.3 Engine PHEVs

Figure 103 shows the manufacturing cost evolution of PHEVs with different fuels. The overall trend is the same for all fuels; only the actual costs vary. PHEV40 costs show a sharp decrease over time, whereas PHEV10 costs show a very slight decrease over time. This observation can be explained by improvements in batteries over time.

Figure 104 shows the manufacturing cost of PHEVs compared with gasoline HEVs. Again, the PHEVs become more cost-competitive over time because of improvements in batteries.

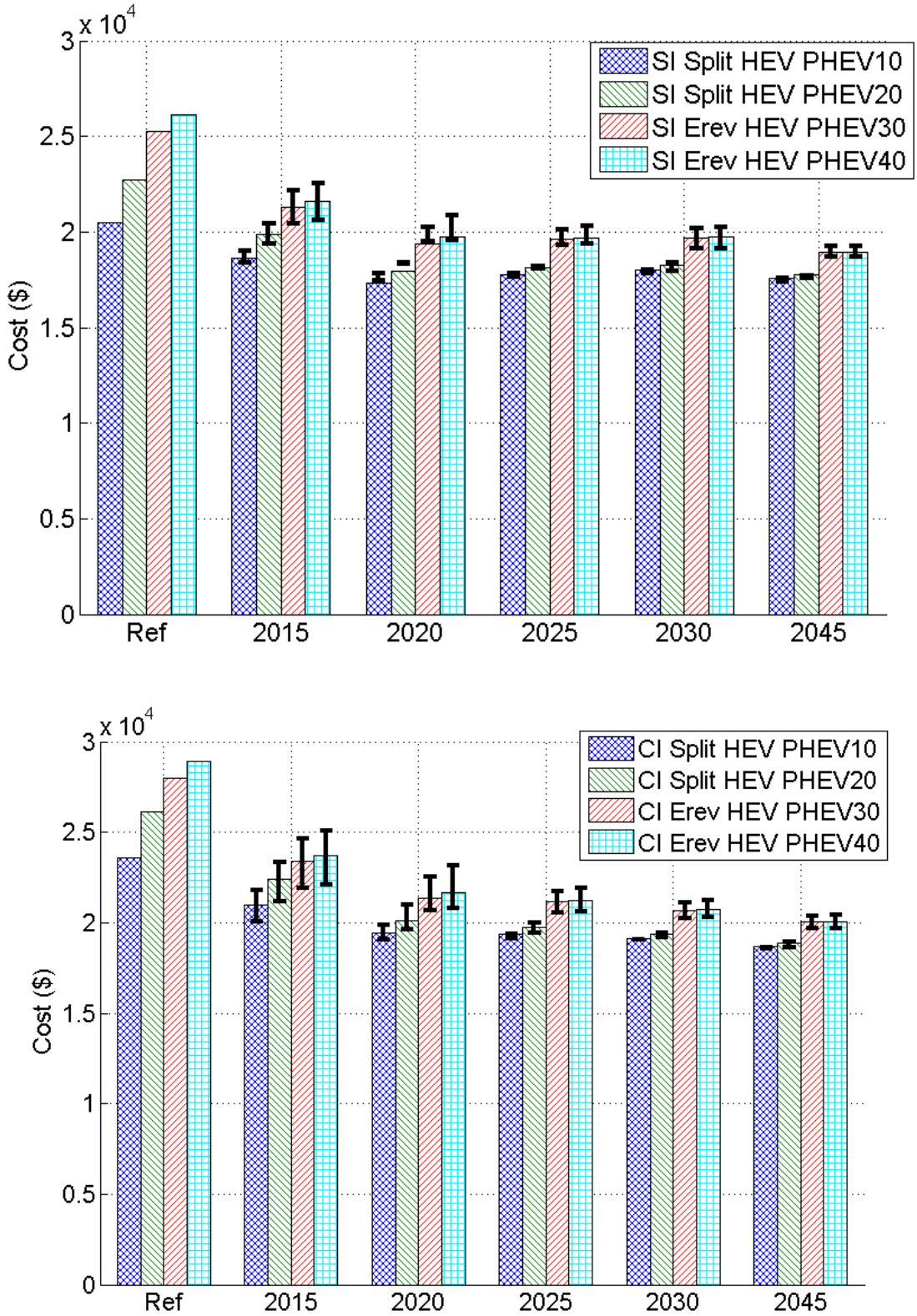
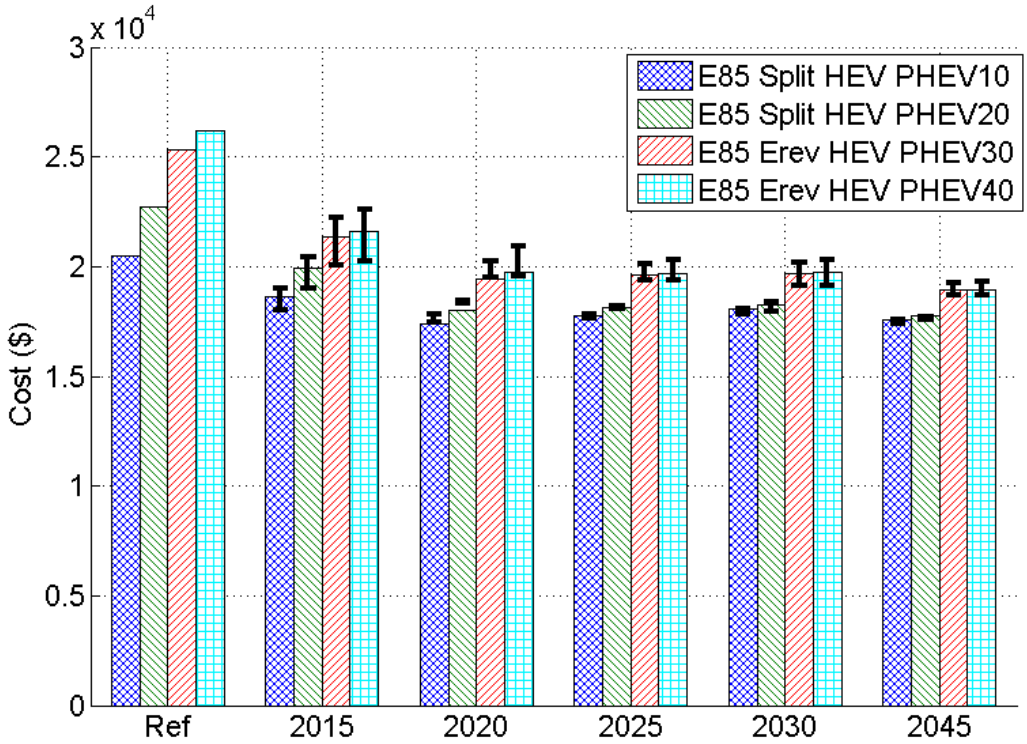


FIGURE 103 Manufacturing cost of PHEVs for all fuels: (1) SI, (2) CI, (3) ethanol, and (4) CNG



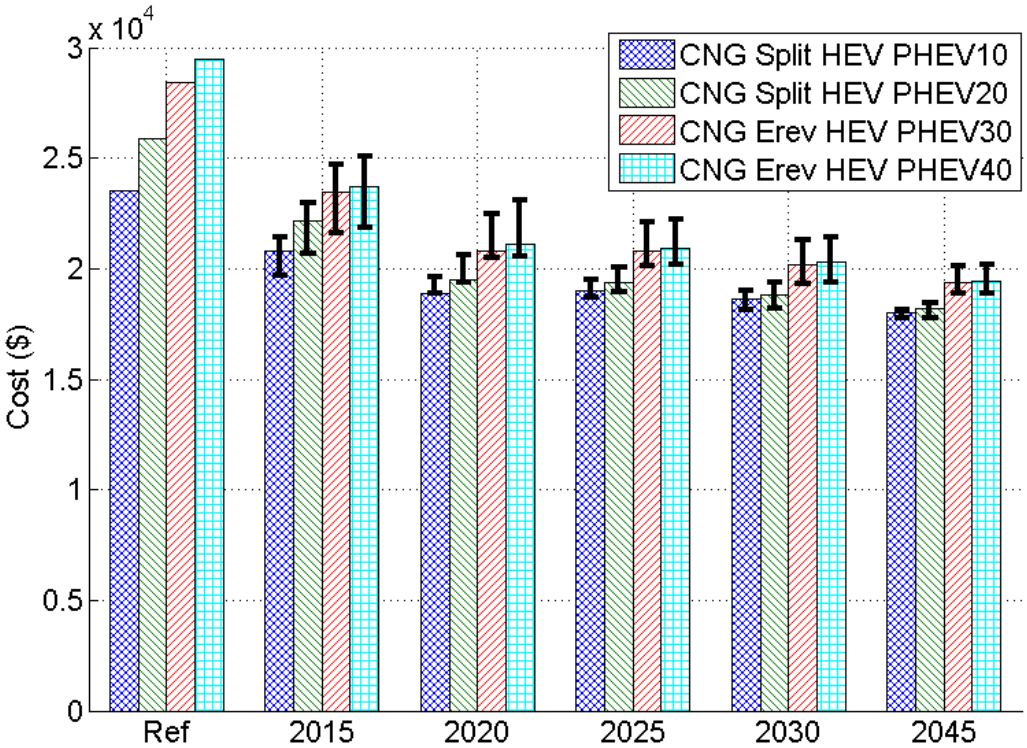


FIGURE 103 Manufacturing cost of PHEVs for all fuels: (1) SI, (2) CI, (3) ethanol, and (4) CNG (Cont.)

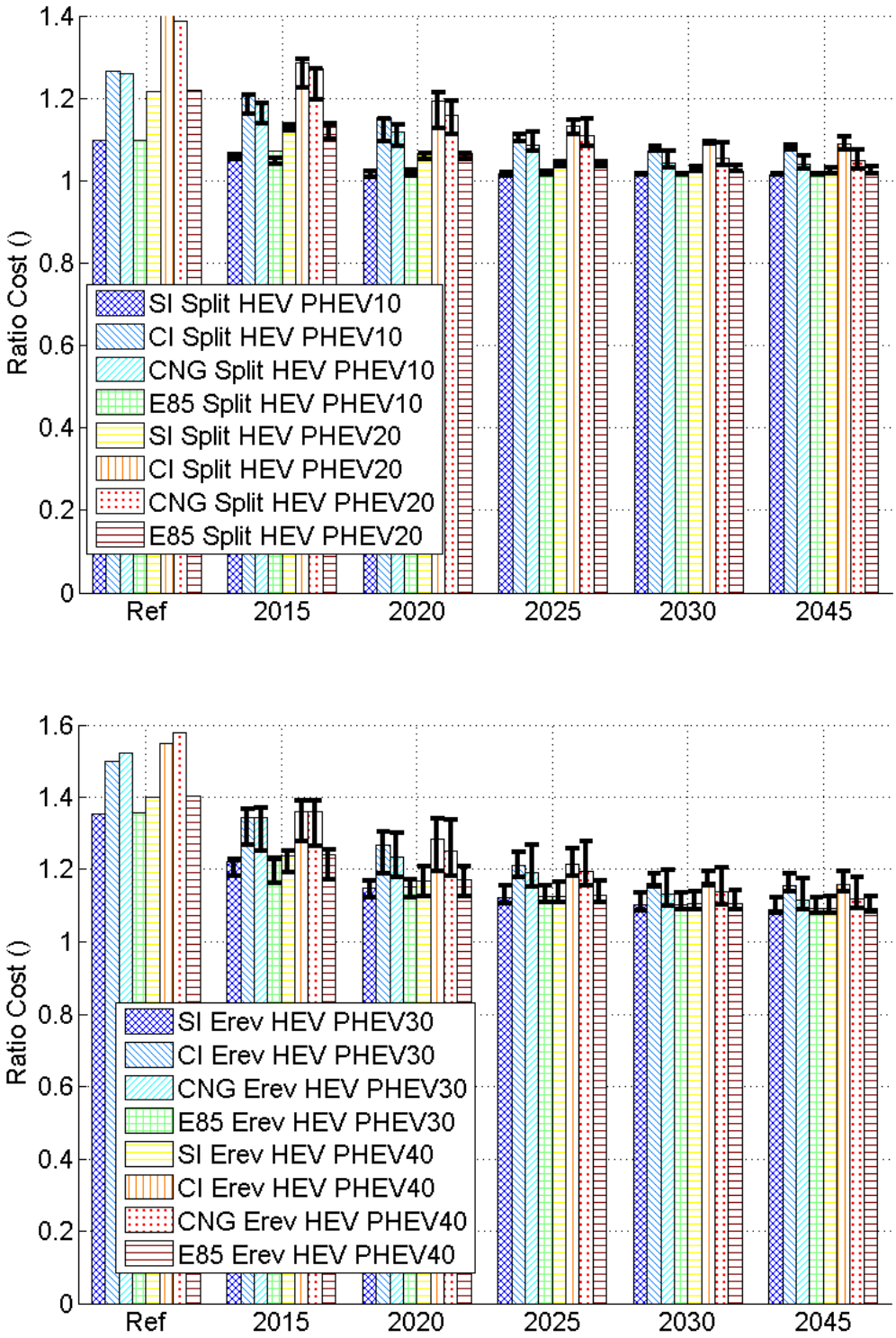


FIGURE 104 Manufacturing costs of midsize PHEV10s and PHEV20s (top) and PHEV30s and PHEV40s (bottom) compared with same-year gasoline HEVs

9.1.4 Fuel-Cell vehicles

Fuel-cell vehicle manufacturing costs (Figure 105) show a pattern similar to that of previously described gasoline-vehicle manufacturing costs. Indeed, as time goes on, the different vehicles' manufacturing costs become closer to each other. In 2010, a fuel-cell PHEV40 is approximately 40% more expensive than a fuel-cell HEV, whereas it is almost as expensive in 2045. Finally, it is interesting to note that in 2045, the fuel-cell vehicle manufacturing costs are under $20,000 for all the average and high cases.

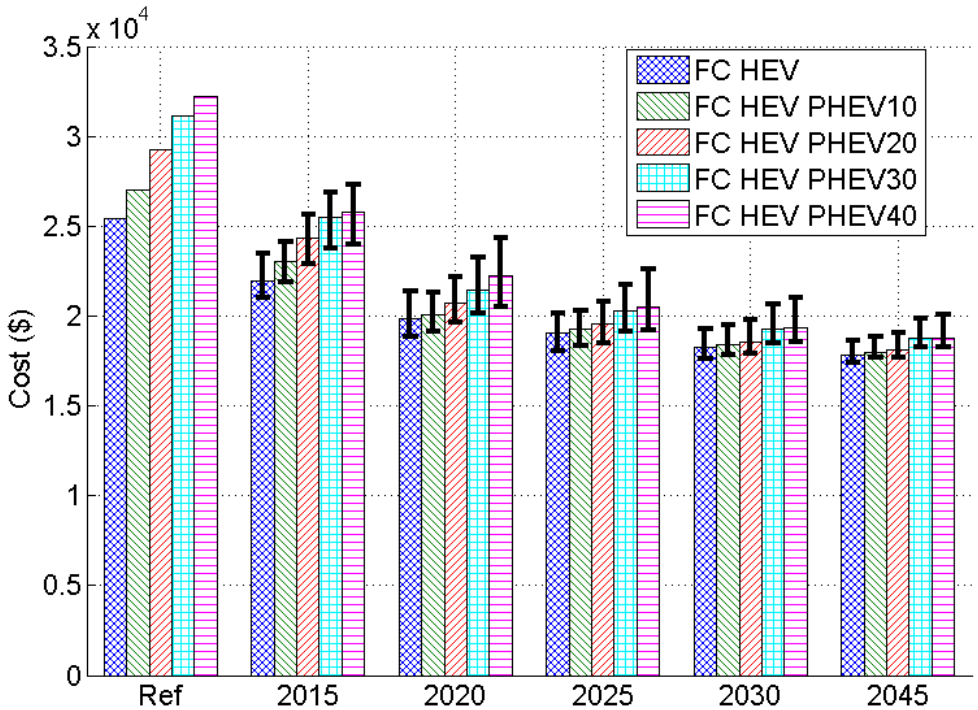


FIGURE 105 Manufacturing costs of midsize fuel-cell vehicles

9.1.5 Electric Vehicles

As shown in Figure 106, improvements in battery costs and lightweighting affect BEV costs, which are expected to decrease by a factor of almost 2 for high-range BEVs.

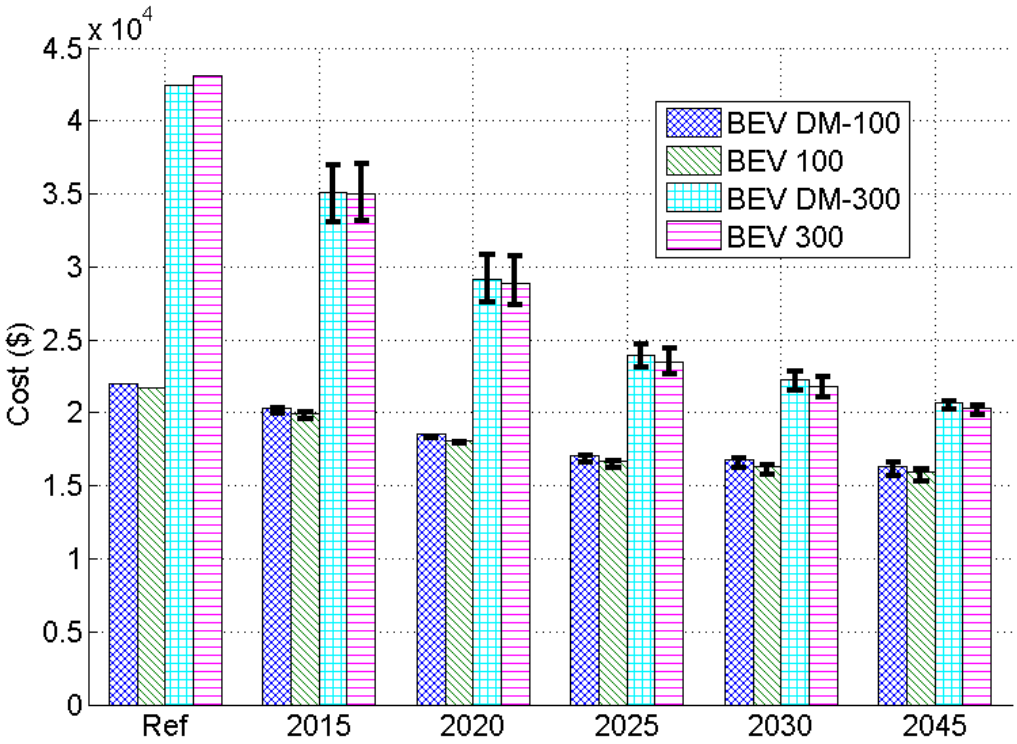


FIGURE 106 Manufacturing costs of midsize BEVs

9.2 POWERTRAIN COMPARISON

Figure 107 shows the manufacturing costs for all the gasoline-powertrain vehicles (conventional, power-split HEV, and power-split PHEV). The manufacturing costs across powertrains tend to get closer to each other as time goes on.

Whereas conventional-vehicle manufacturing costs increase slightly over time, the opposite pattern is observed for power-split HEVs. The higher the AER, the greater the manufacturing cost reduction over time.

Figure 108 shows the relative manufacturing costs of CNG vehicles and conventional gasoline vehicles. While CNG engines will remain more expensive, the technology will become more cost-competitive over time.

Figure 109 shows the manufacturing cost ratio between fuel-cell and conventional gasoline vehicles.

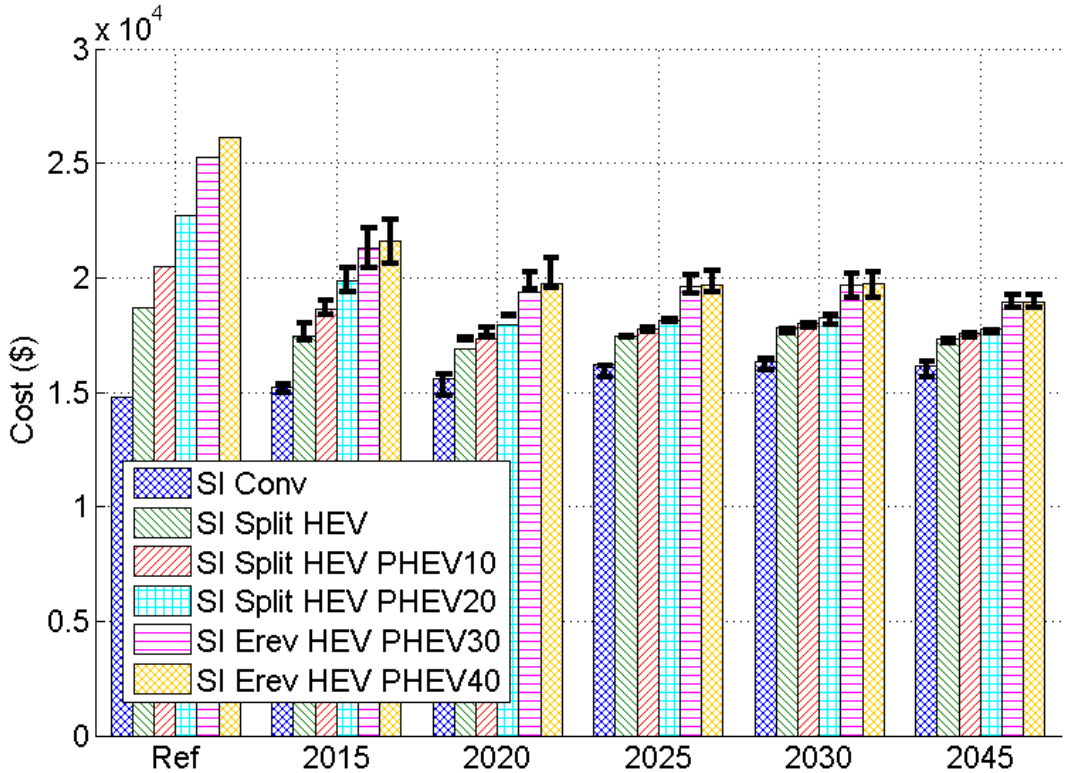


FIGURE 107 Manufacturing costs of midsize gasoline vehicles

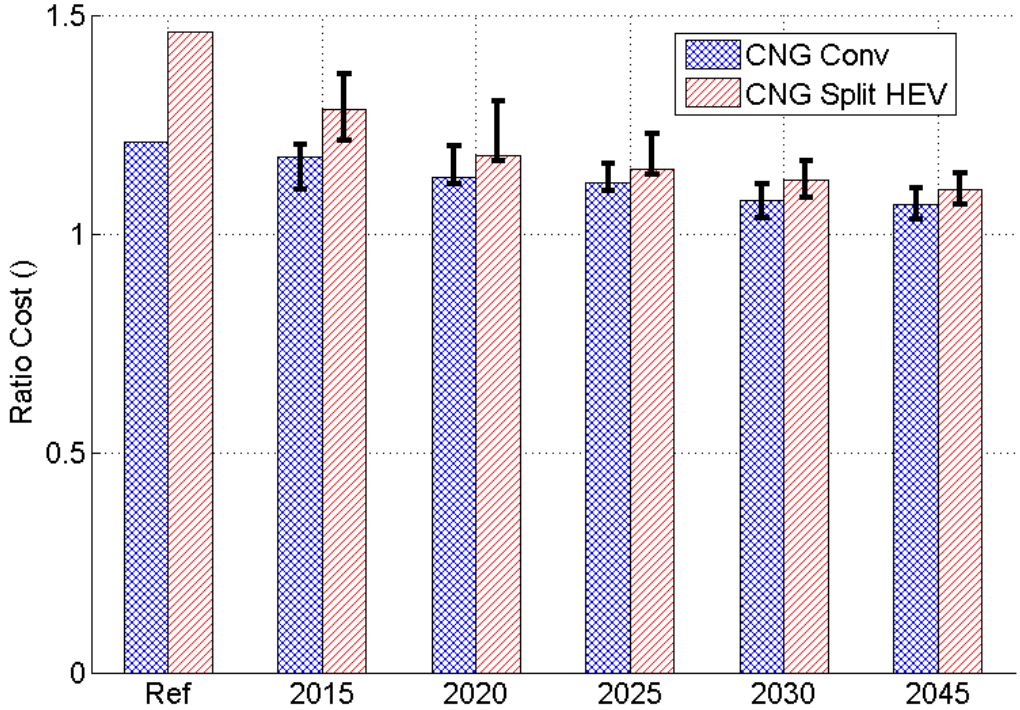


FIGURE 108 Manufacturing costs of midsize CNG ICE vehicles compared with same-year conventional gasoline vehicles

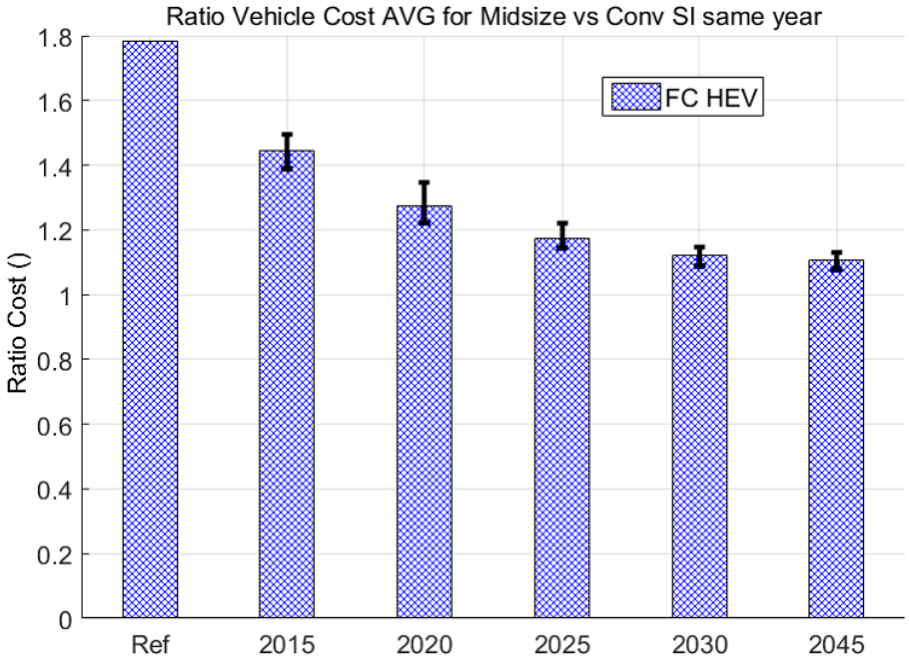


FIGURE 109 Manufacturing costs of midsize fuel-cell HEVs compared with same-year conventional gasoline vehicles

10 Trade-off Between Vehicle Fuel Consumption and Manufacturing Cost

All costs in this section are manufacturing costs.

10.1 Conventional Vehicles

Figure 110 shows that diesel vehicles remain more expensive relative to other conventional vehicles over time, with no advantage in fuel consumption. This statement holds true for CNG vehicles.

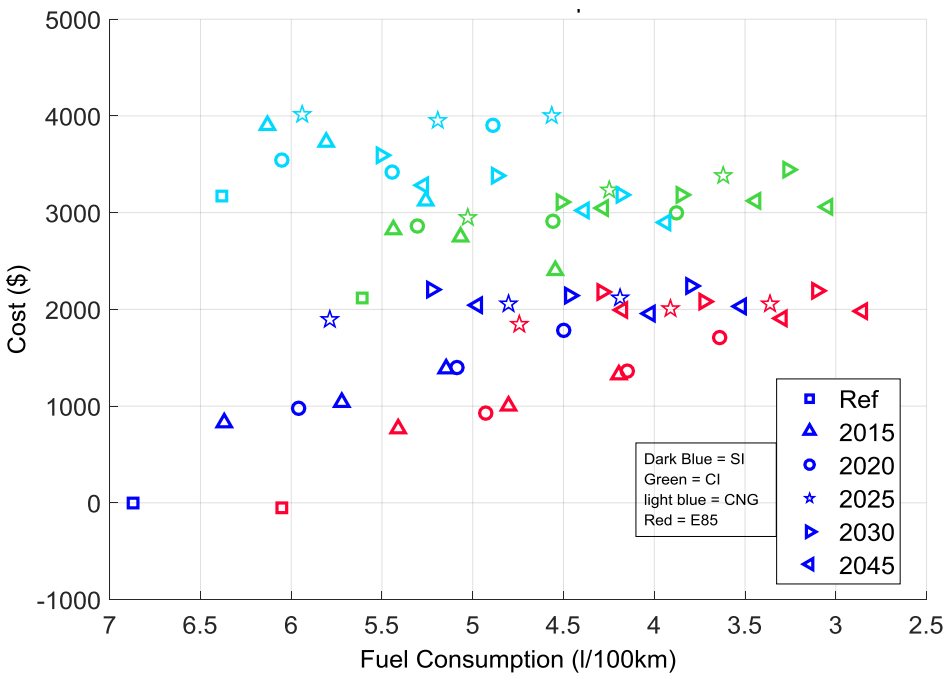


FIGURE 110 Incremental midsize conventional vehicle manufacturing costs compared with reference conventional gasoline vehicle manufacturing costs as a function of fuel consumption

10.2 HEVs

Figure 111 shows similar trends for HEVs, independent of ICE technology. The overall trend is decreasing, which means lower fuel consumption and lower cost. Gasoline and ethanol HEVs offer the best trade-offs over time, with the CNG HEV becoming competitive in the 2045 timeframe.

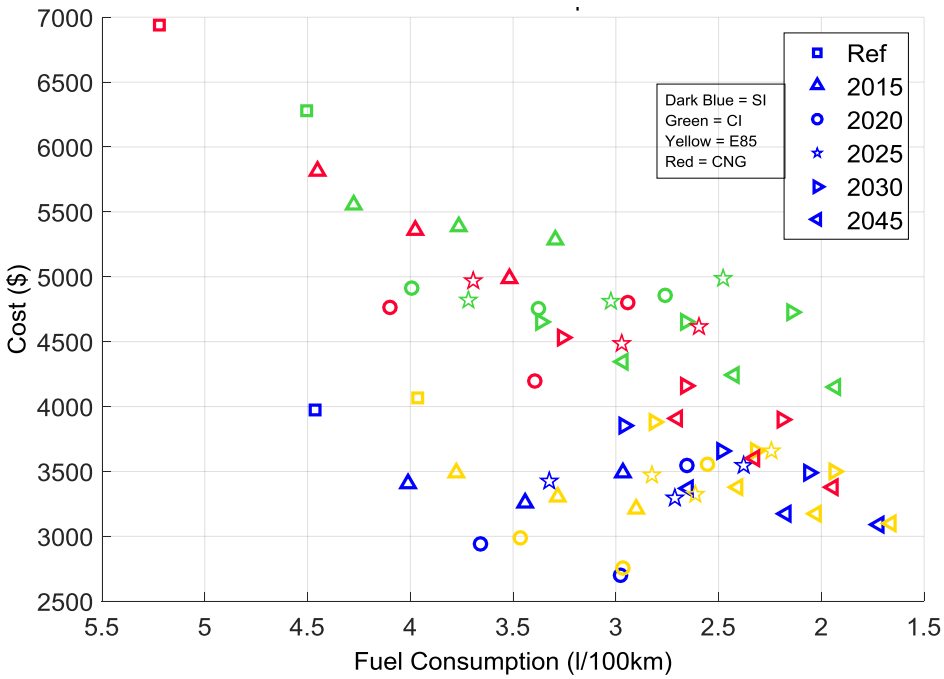


FIGURE 111 Incremental midsize HEV manufacturing costs compared with reference conventional gasoline vehicle manufacturing costs as a function of fuel consumption

10.3 PHEVs

Figures 112 and 113 show, respectively, that PHEV10 and PHEV40 vehicles offer overall trends that are promising. Engine/fuel type appears to be less sensitive.

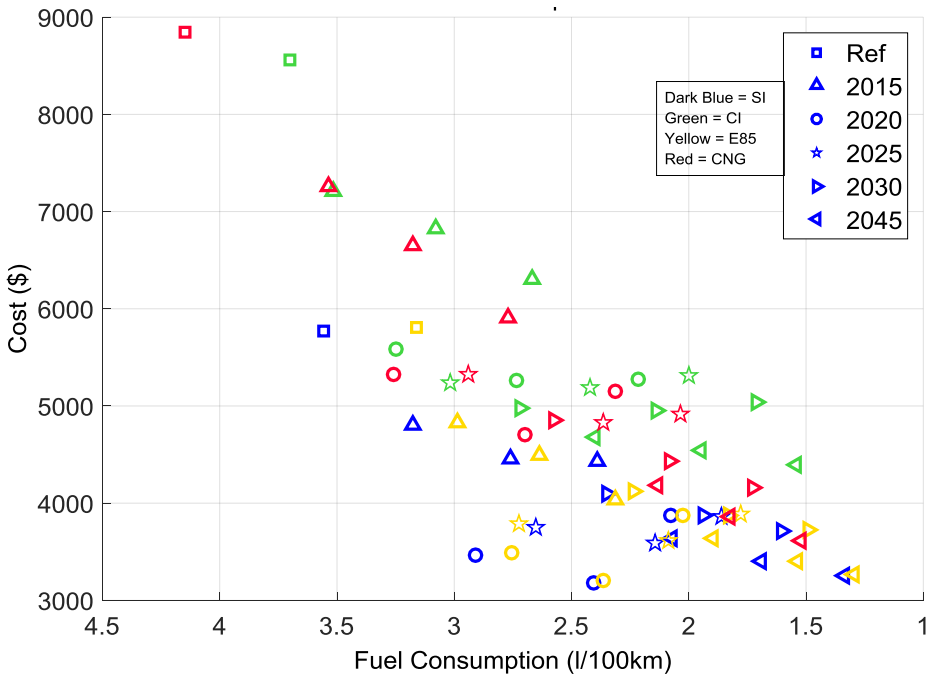


FIGURE 112 Incremental PHEV10 manufacturing costs compared with reference conventional gasoline vehicle manufacturing costs as a function of fuel consumption

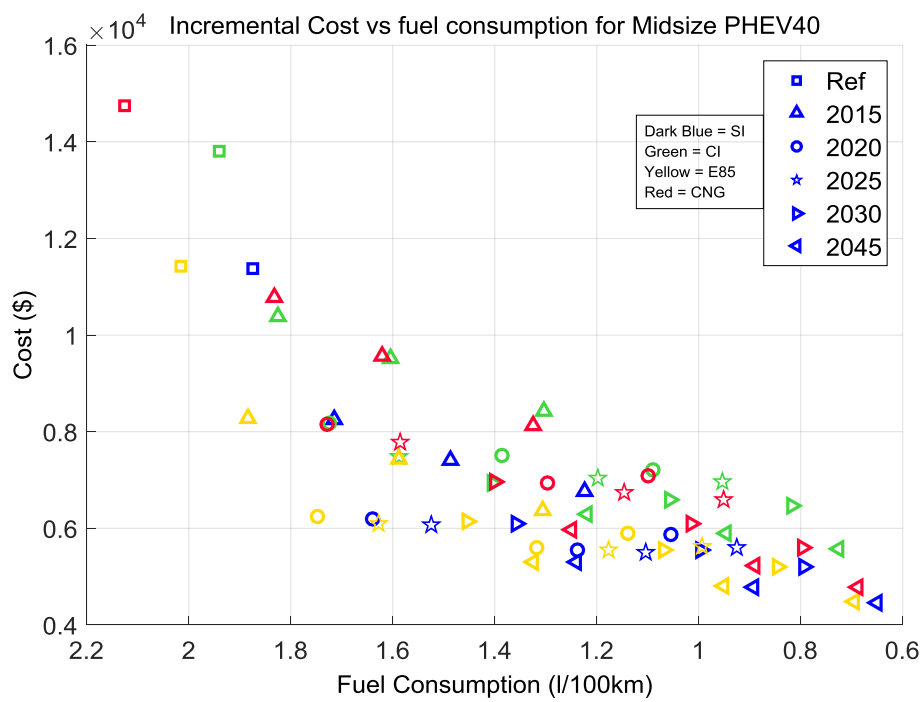


FIGURE 113 Incremental PHEV40 manufacturing costs compared with reference conventional gasoline vehicle manufacturing costs as a function of fuel consumption

10.4 Fuel-Cell and Other Hydrogen-Fueled Vehicles

Figure 114 shows the trade-offs of incremental manufacturing cost versus fuel consumption for fuel-cell HEVs and PHEVs compared with the reference conventional gasoline vehicles. For the PHEVs, we found a diminishing return on investment, since little fuel-efficiency gain is achieved for the higher AER despite a higher manufacturing cost. Overall, all configurations trend toward good fuel efficiency at a low manufacturing cost.

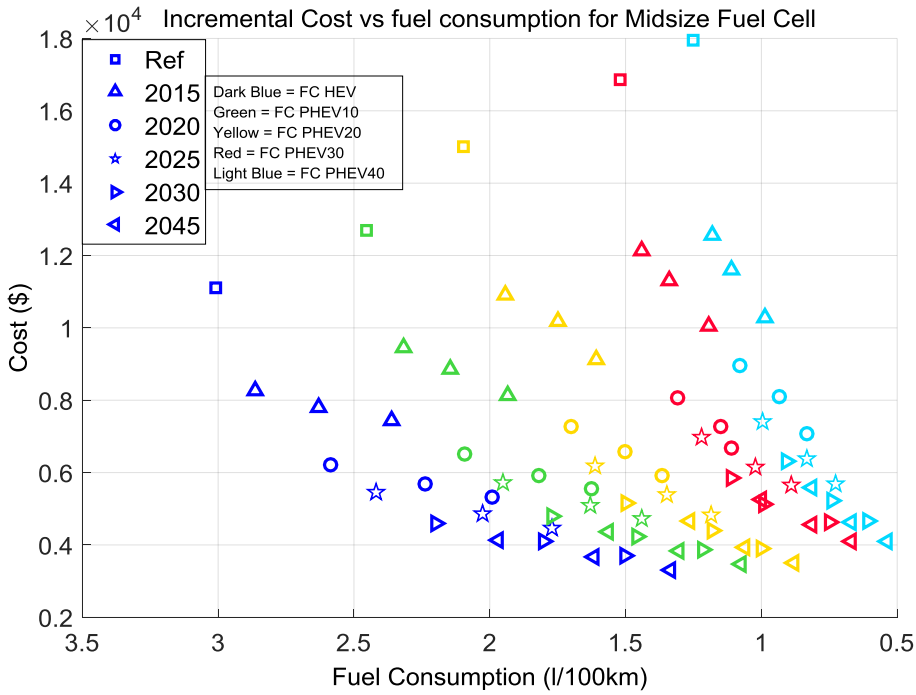


FIGURE 114 Incremental fuel-cell vehicle manufacturing costs compared with reference conventional gasoline vehicle manufacturing costs as a function of fuel consumption

10.5 All Powertrains

Figure 115 shows the trade-offs between fuel consumption and increased manufacturing costs for all powertrains and fuels compared with the conventional gasoline reference case. Overall, the vehicles on the bottom right would provide the best fuel consumption for the least additional cost. All years, all cases, and all fuels are presented.

Figure 116 shows a comparison of all powertrains for gasoline fuel only. The main conclusion to be drawn from Figure 116 is that conventional vehicles are more likely to improve in fuel efficiency than in cost, whereas the higher the electrification level, the more the improvement focuses on cost.

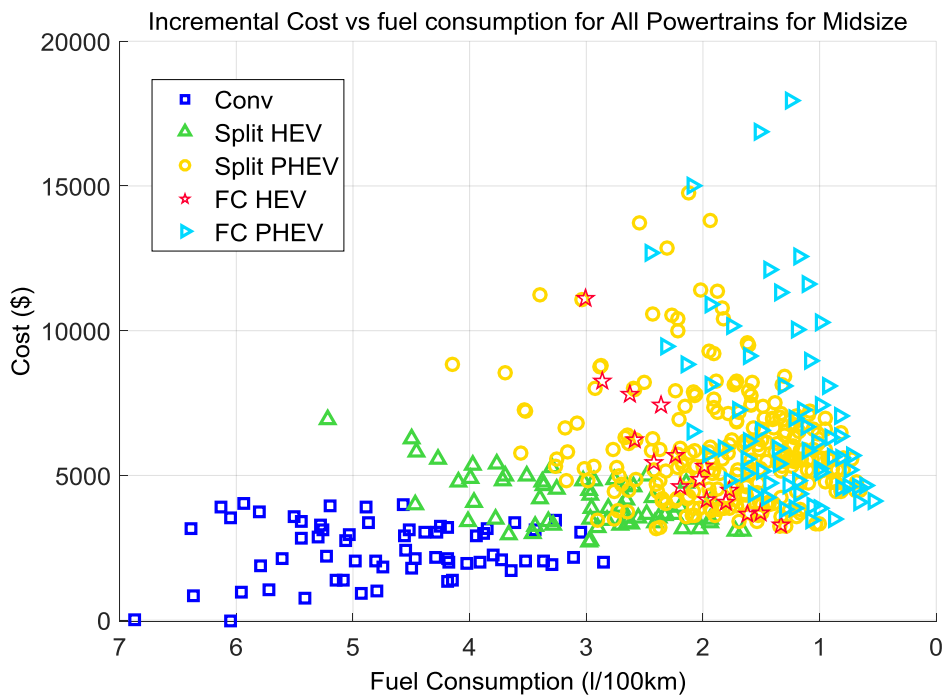


FIGURE 115 Incremental manufacturing costs of all powertrains compared with reference gasoline conventional vehicle manufacturing costs as a function of fuel consumption

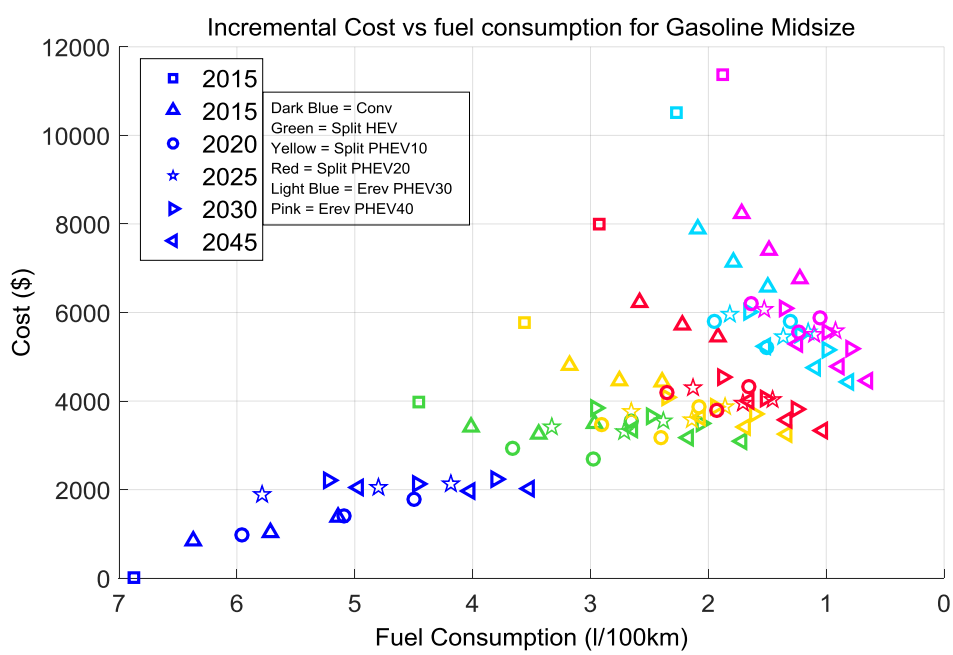
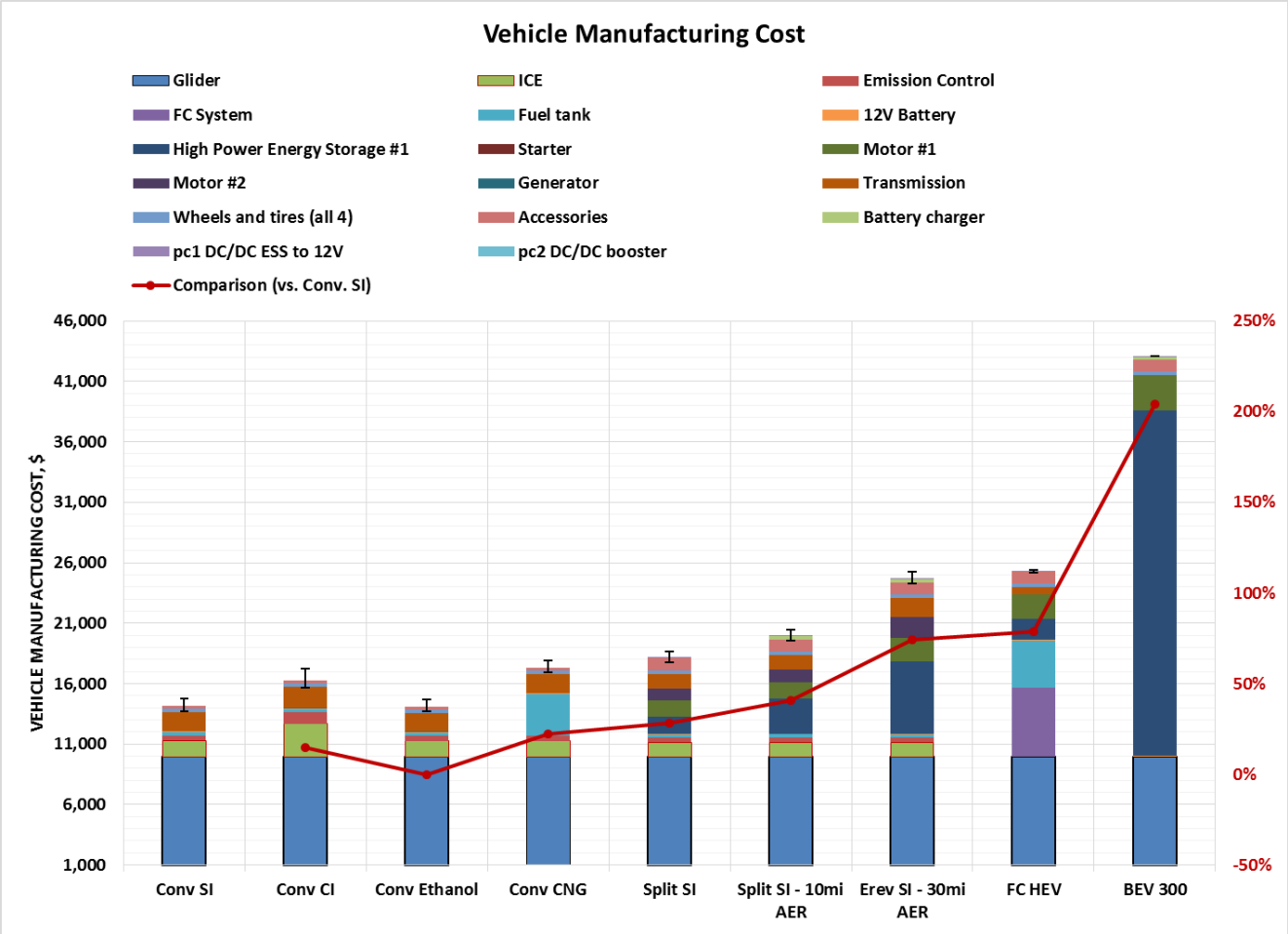


FIGURE 116 Incremental gasoline vehicle manufacturing costs compared with reference conventional gasoline vehicle manufacturing costs as a function of fuel consumption

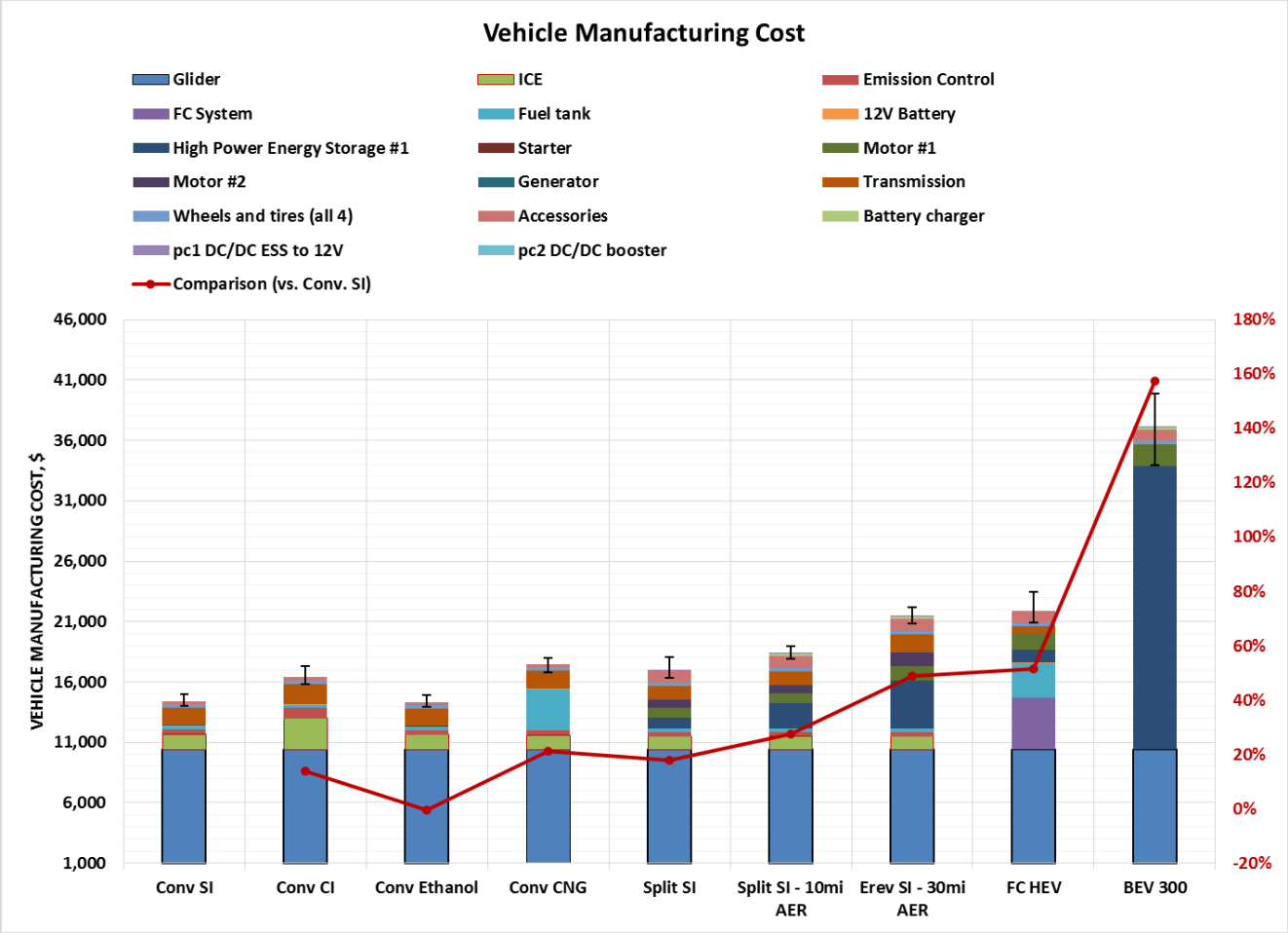
11 VEHICLE COMPONENT MANUFACTURING COSTS - SUMMARY PLOTS

The following figures breakdown the detailed component costs for different vehicle powertrain across years. The error bar represents the cost uncertainty. The technological uncertainties case are separated by different plots. Also, only the midsize class is illustrated in the following figures.

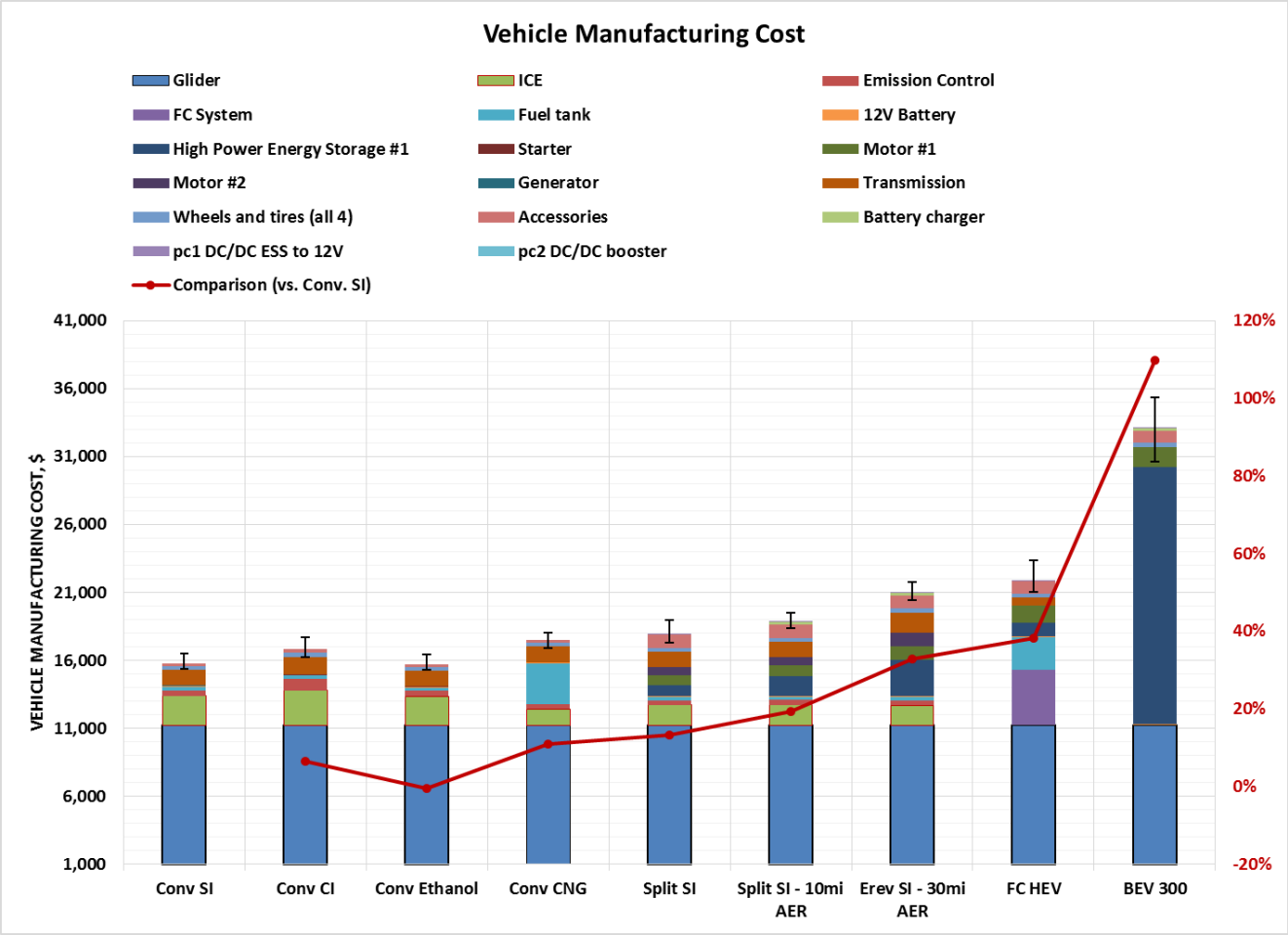
11.1 MIDSIZE 2010 LAB – LOW TECH UNCERTAINTY CASE



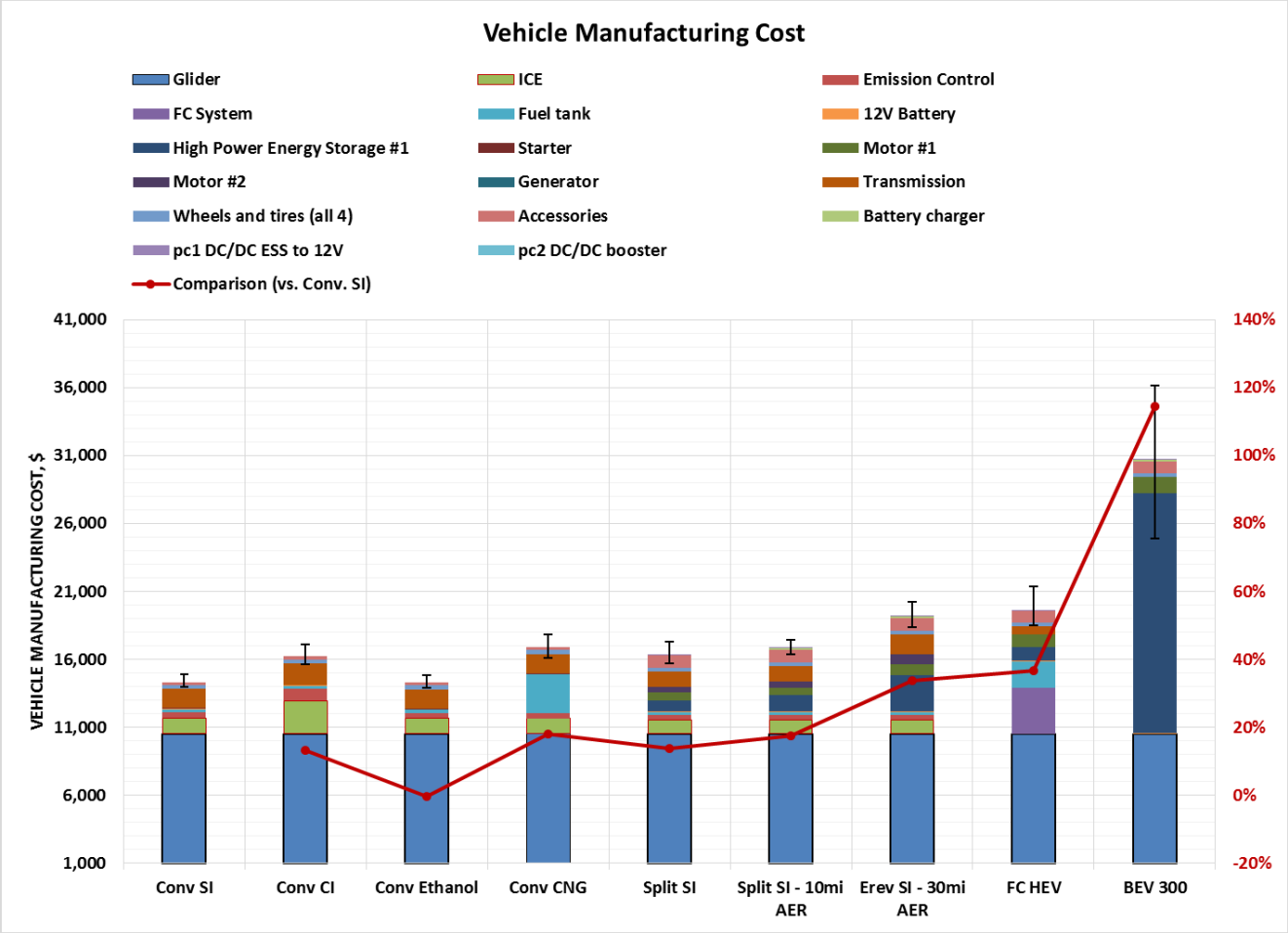
11.2 Midsize 2015 lab – Low Tech Uncertainty Case



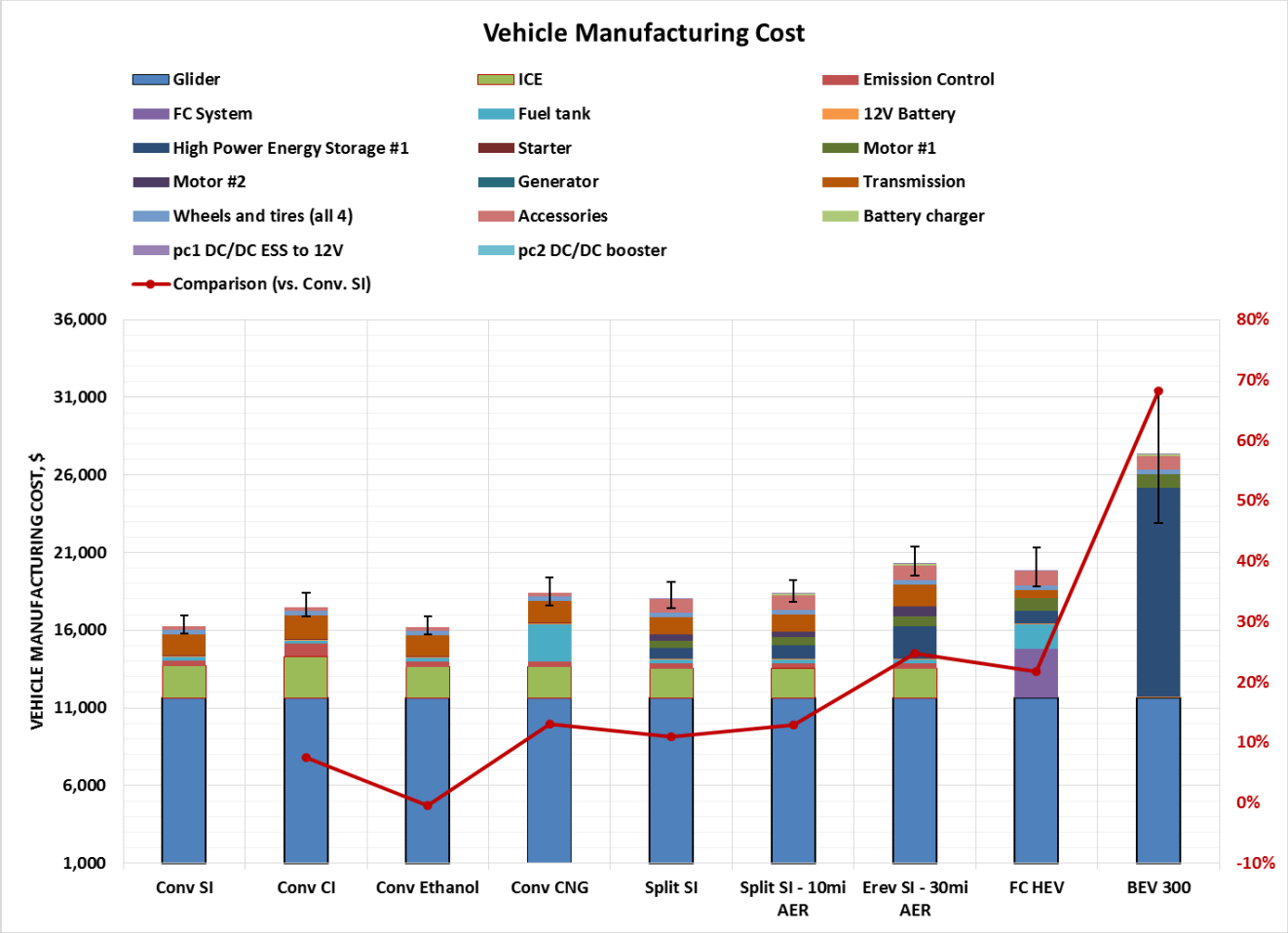
11.3 Midsize 2015 lab – High Tech Uncertainty Case



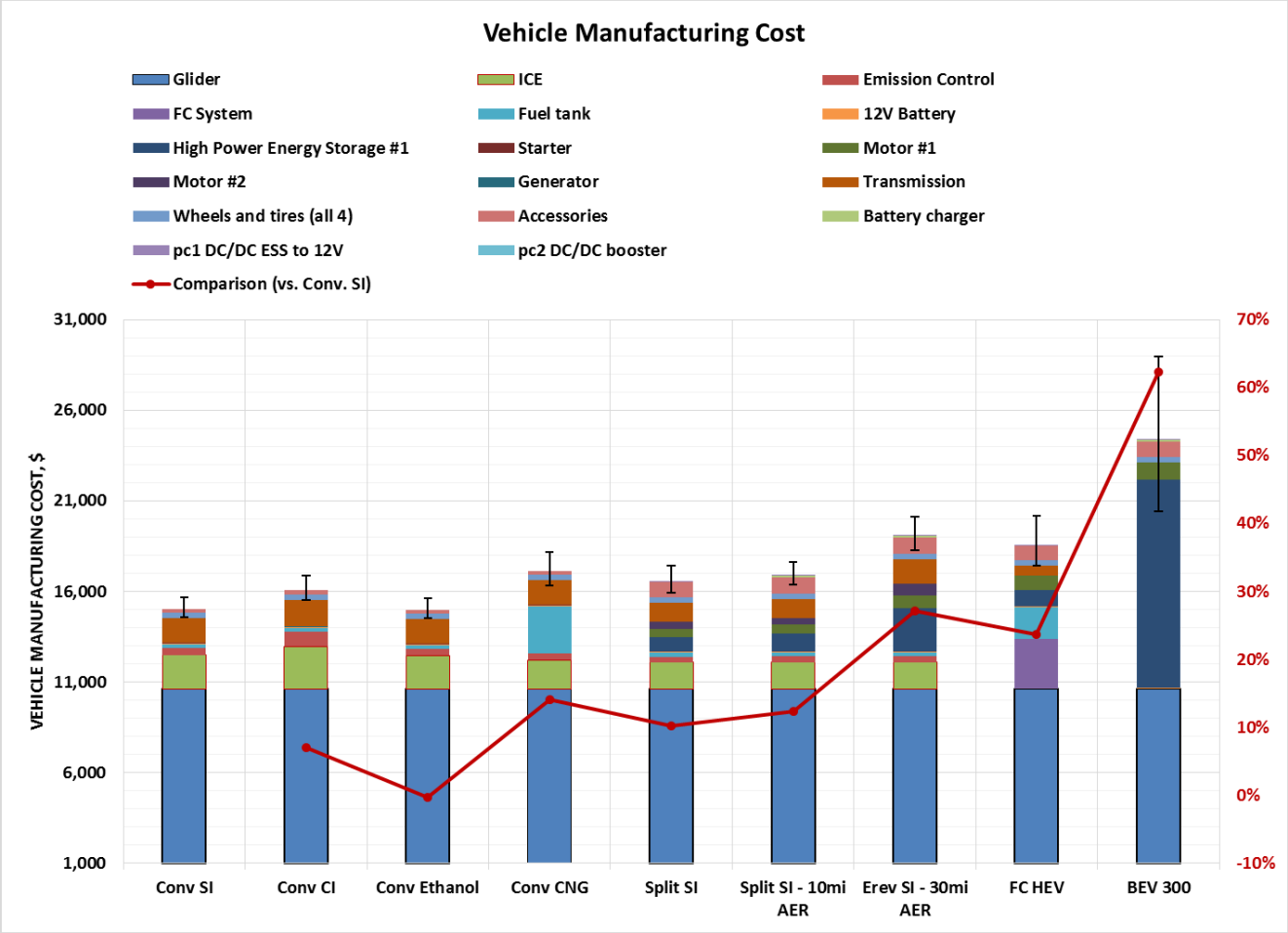
11.4 Midsize 2020 lab – Low Tech Uncertainty Case



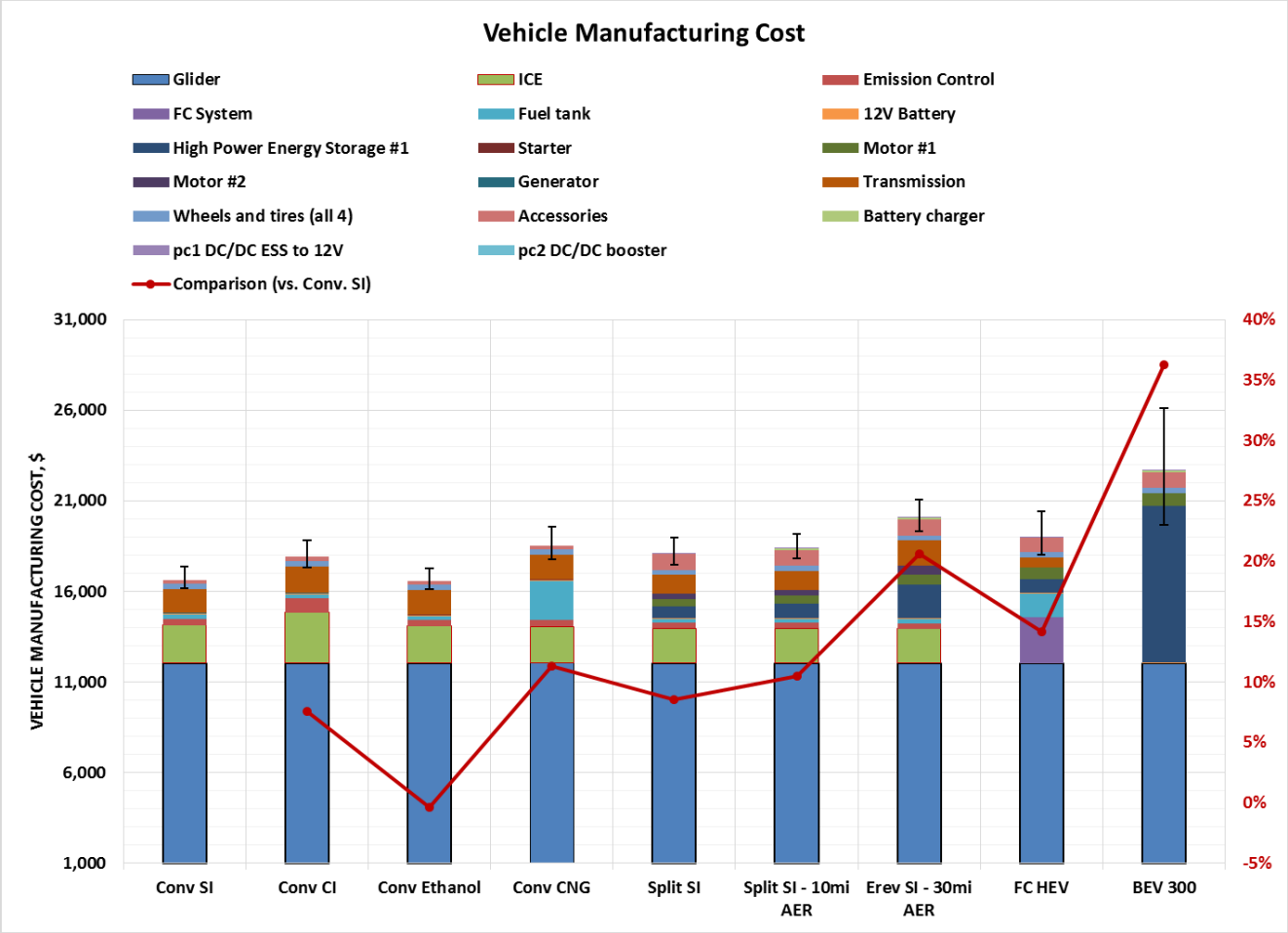
11.5 Midsize 2020 lab – High Tech Uncertainty Case



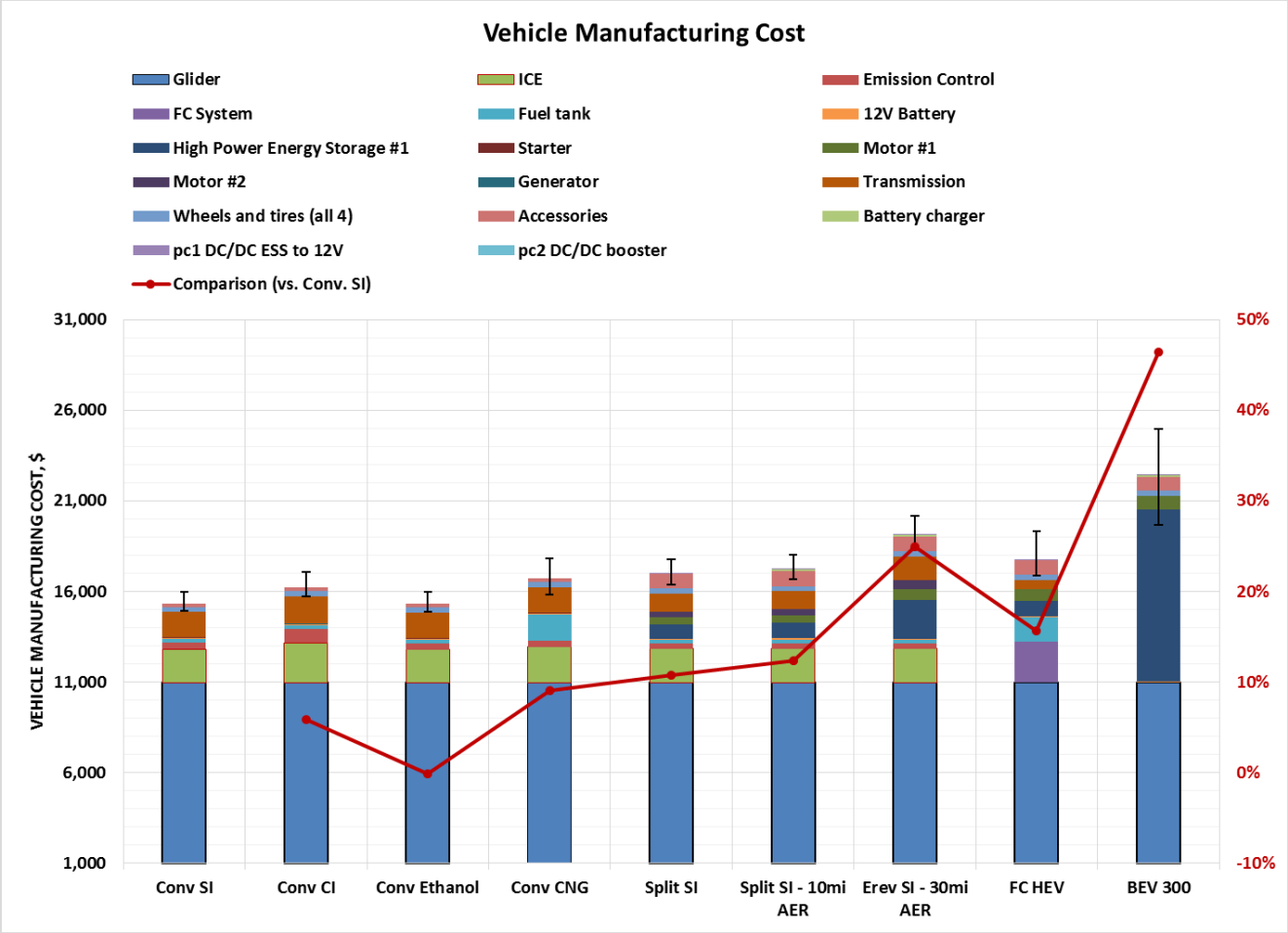
11.6 Midsize 2025 lab – Low Tech Uncertainty Case



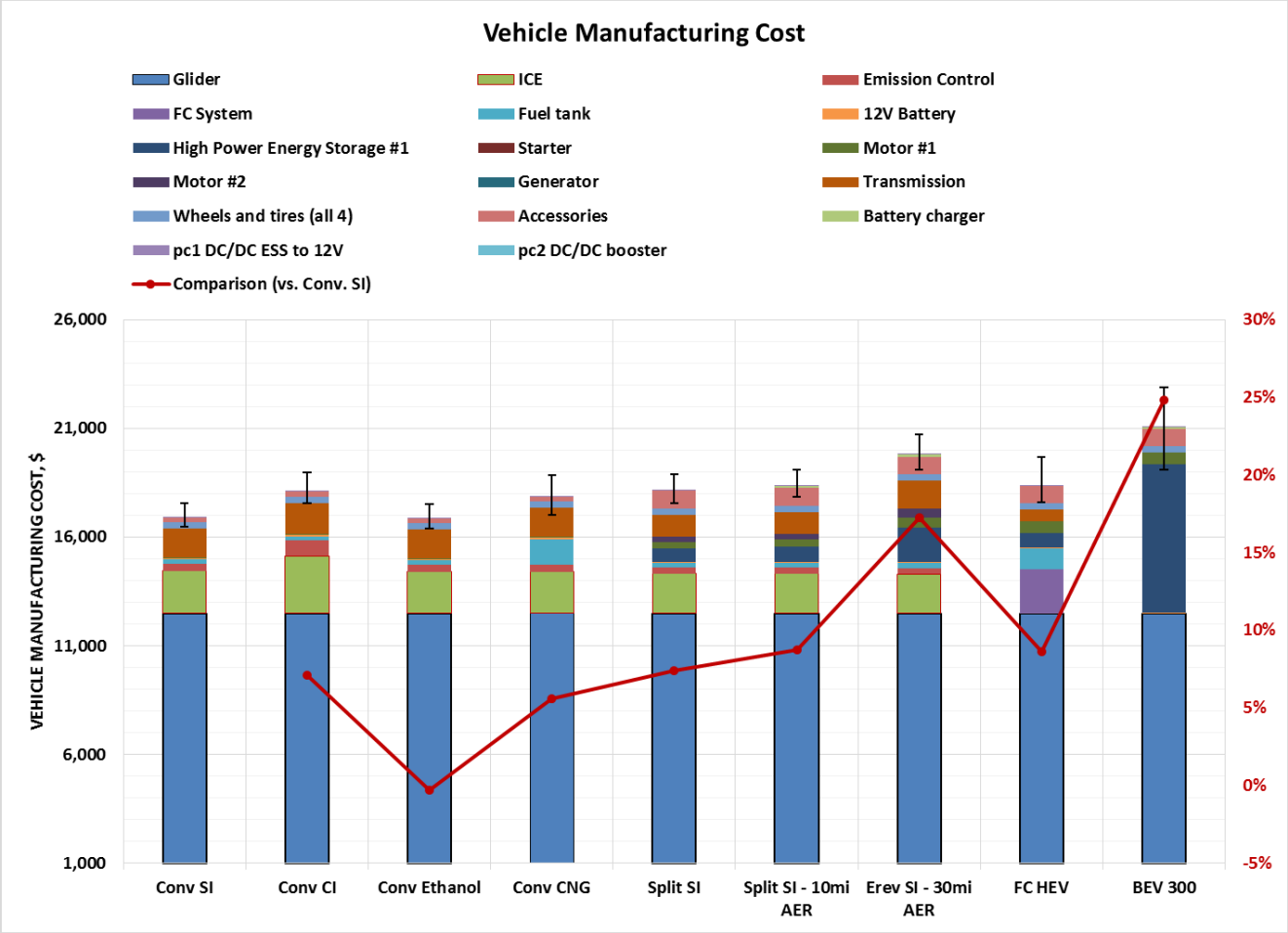
11.7 Midsize 2025 lab – High Tech Uncertainty Case



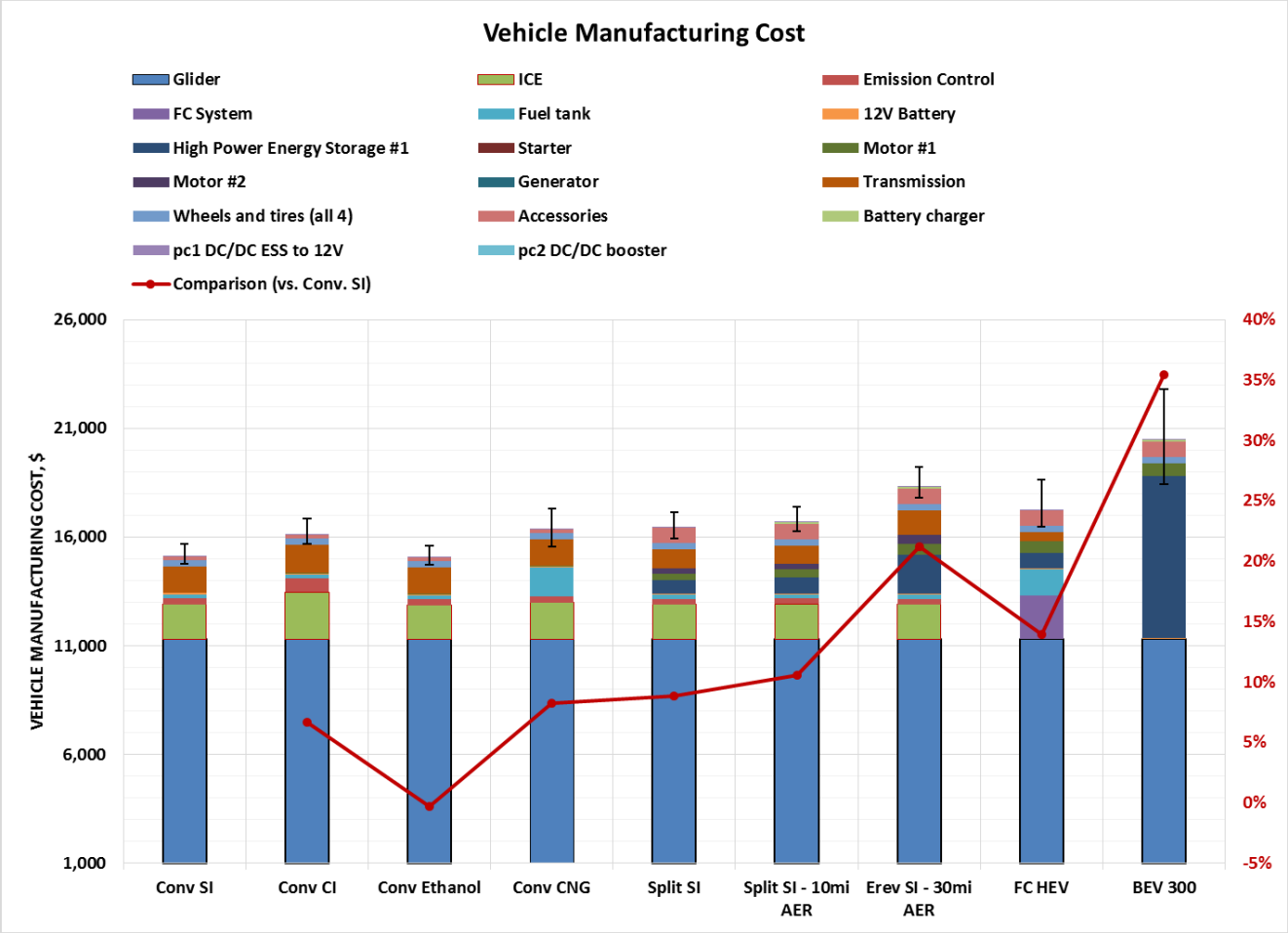
11.8 Midsize 2030 lab – Low Tech Uncertainty Case



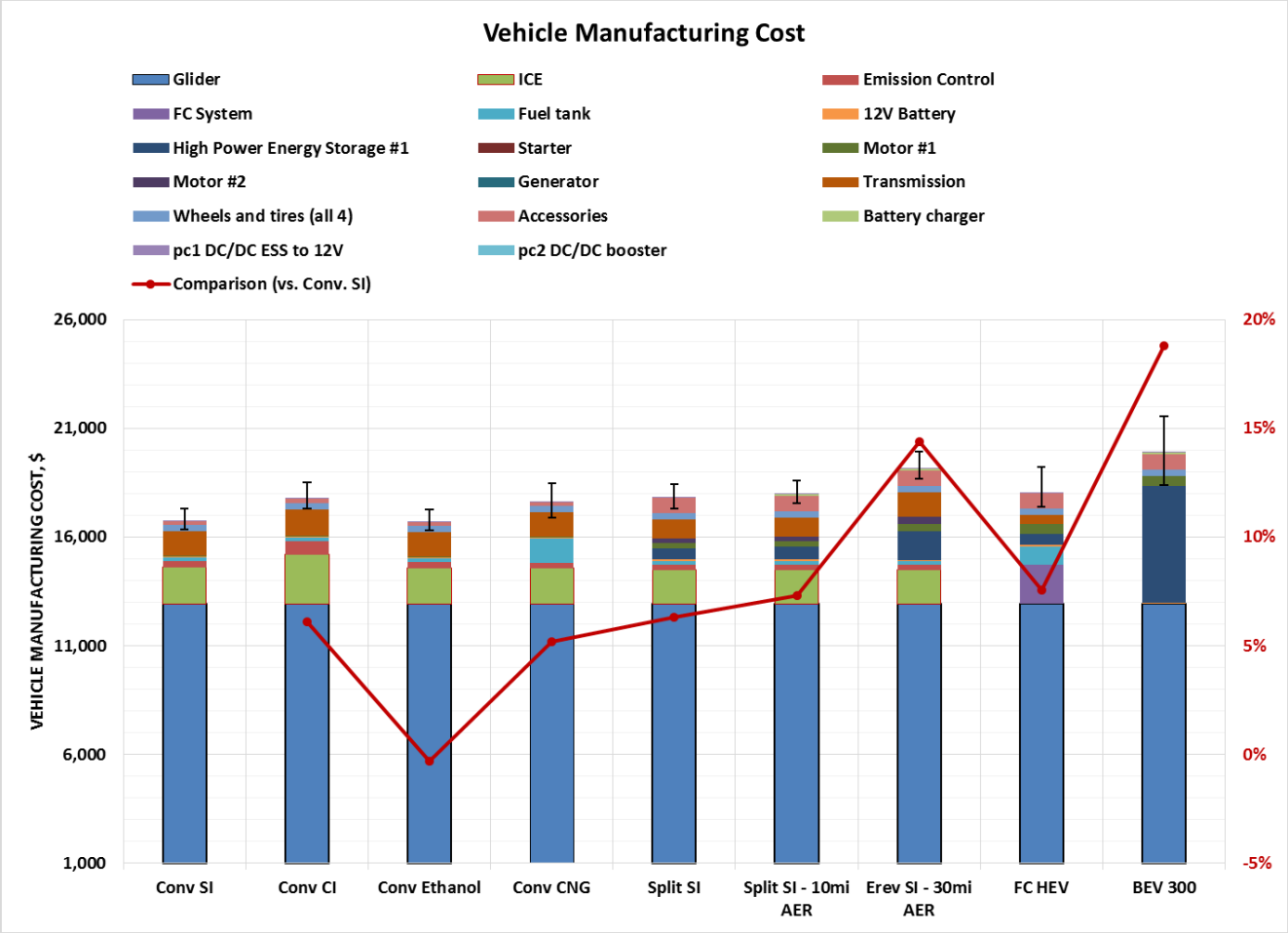
11.9 Midsize 2030 lab – High Tech Uncertainty Case



11.10 Midsize 2045 lab – Low Tech Uncertainty Case



11.11 Midsize 2045 lab – High Tech Uncertainty Case



12 APPENDIX

In the following, a sample of the detailed results tables are shown for the midsize car only. The focus is on some component costs and weights.

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Conventional	2010	low	low	Midsize	CI	1647	17264	62	0	3229	0	0	1995	276	163	0		75	0	85	1000
Conventional	2010	low	low	Midsize	CNG	1704	17891	62	0	1534	0	0	1803	3446	167	0		75	0	85	1000
Conventional	2010	low	low	Midsize	E85	1574	14713	62	0	1538	0	0	1768	310	124	0		75	0	85	1000
Conventional	2010	low	low	Midsize	SI	1580	14769	62	0	1573	0	0	1766	310	132	0		75	0	85	1000
BEV100 DM	2010	low	low	Midsize		1671	22066	7840	0	0	1919	0	731	0	0	0	94	75	216	85	1000
BEV100	2010	low	low	Midsize		1621	21743	8009	0	0	2159	0	0	0	0	0	105	0	220	85	1000
BEV 200 DM	2010	low	low	Midsize		1830	31525	16931	0	0	2288	0	731	0	0	0	111	75	358	85	1000
BEV 200	2010	low	low	Midsize		1784	31354	17279	0	0	2499	0	0	0	0	0	122	0	366	85	1000
BEV300 DM	2010	low	low	Midsize		2072	42540	27678	0	0	2555	0	731	0	0	0	125	75	586	85	1000
BEV300	2010	low	low	Midsize		2043	43077	28617	0	0	2884	0	0	0	0	0	141	0	606	85	1000
EREV PHEV30	2010	low	low	Midsize	CI	1970	27958	6140	0	3158	2060	1802	1823	276	158	0	100	75	162	85	1000
EREV PHEV30	2010	low	low	Midsize	CNG	2020	28407	6232	0	1427	2127	1843	1823	2864	159	0	104	75	165	85	1000
EREV PHEV30	2010	low	low	Midsize	E85	1881	25313	5998	0	1428	1948	1728	1823	310	113	0	95	75	159	85	1000
EREV PHEV30	2010	low	low	Midsize	SI	1876	25258	5989	0	1392	1941	1725	1823	310	112	0	95	75	158	85	1000
EREV PHEV40	2010	low	low	Midsize	CI	2039	28912	6822	0	3175	2241	1862	1823	276	159	0	109	75	218	85	1000
EREV PHEV40	2010	low	low	Midsize	CNG	2092	29462	6949	0	1445	2315	1907	1823	2925	160	0	113	75	222	85	1000
EREV PHEV40	2010	low	low	Midsize	E85	1945	26177	6617	0	1445	2113	1785	1823	310	114	0	103	75	211	85	1000
EREV PHEV40	2010	low	low	Midsize	SI	1942	26126	6611	0	1409	2107	1782	1823	310	114	0	103	75	211	85	1000
FC Series HEV	2010	low	low	Midsize		1763	25389	1724	5722	0	2040	0	731	3869	0	131	99	75	22	85	1000
FC Series PHEV10	2010	low	low	Midsize		1833	26975	2908	5802	0	2184	0	731	3797	0	140	106	75	79	85	1000
FC Series PHEV20	2010	low	low	Midsize		1920	29281	5052	5898	0	2184	0	731	3863	0	146	106	75	157	85	1000

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
FC Series PHEV30	2010	low	low	Midsize		1949	31136	6589	5934	0	2139	0	731	4166	0	148	104	75	174	85	1000
FC Series PHEV40	2010	low	low	Midsize		2024	32227	7432	6016	0	2185	0	731	4288	0	154	106	75	237	85	1000
Split PHEV10	2010	low	low	Midsize	CI	1847	23612	3239	0	3172	1286	1549	1403	276	159	0	63	75	88	85	1000
Split PHEV10	2010	low	low	Midsize	CNG	1873	23497	3116	0	1460	1429	1124	1403	2883	161	0	70	75	84	85	1000
Split PHEV10	2010	low	low	Midsize	E85	1739	20505	2945	0	1447	1299	1038	1403	310	115	0	63	75	80	85	1000
Split PHEV10	2010	low	low	Midsize	SI	1736	20463	2943	0	1411	1297	1036	1403	310	115	0	63	75	80	85	1000
Split PHEV20	2010	low	low	Midsize	CI	1940	26112	5632	0	3194	1286	1615	1403	276	161	0	63	75	175	85	1000
Split PHEV20	2010	low	low	Midsize	CNG	1960	25881	5398	0	1485	1429	1172	1403	2902	163	0	70	75	167	85	1000
Split PHEV20	2010	low	low	Midsize	E85	1820	22727	5101	0	1467	1299	1076	1403	310	117	0	63	75	158	85	1000
Split PHEV20	2010	low	low	Midsize	SI	1817	22690	5104	0	1431	1297	1075	1403	310	117	0	63	75	158	85	1000
Split HEV	2010	low	low	Midsize	CI	1765	21316	1455	0	3136	1195	1445	1403	276	156	0	58	75	19	85	1000
Split HEV	2010	low	low	Midsize	CNG	1805	21588	1509	0	1441	1534	1086	1403	2791	160	0	75	75	19	85	1000
Split HEV	2010	low	low	Midsize	E85	1673	18762	1509	0	1426	1316	995	1403	310	112	0	64	75	19	85	1000
Split HEV	2010	low	low	Midsize	SI	1669	18658	1455	0	1390	1305	993	1403	310	112	0	64	75	18	85	1000
Conventional	2015	high	low	Midsize	CI	1450	17668	62	0	3014	0	0	1466	263	159	0		75	0	85	807
Conventional	2015	high	low	Midsize	CNG	1452	18014	62	0	1389	0	0	1308	2995	161	0		75	0	85	807
Conventional	2015	high	low	Midsize	E85	1375	16409	62	0	2513	0	0	1286	295	118	0		75	0	85	807
Conventional	2015	high	low	Midsize	SI	1381	16486	62	0	2556	0	0	1294	295	126	0		75	0	85	807
BEV100 DM	2015	high	low	Midsize		1361	20699	6129	0	0	1142	0	695	0	0	0	70	75	123	85	807
BEV100	2015	high	low	Midsize		1307	20312	6293	0	0	1286	0	0	0	0	0	78	0	126	85	807
BEV 200 DM	2015	high	low	Midsize		1455	27719	12956	0	0	1334	0	695	0	0	0	81	75	206	85	807
BEV 200	2015	high	low	Midsize		1401	27389	13207	0	0	1448	0	0	0	0	0	88	0	210	85	807
BEV300 DM	2015	high	low	Midsize		1581	35331	20459	0	0	1444	0	695	0	0	0	88	75	325	85	807
BEV300	2015	high	low	Midsize		1534	35361	21039	0	0	1588	0	0	0	0	0	97	0	334	85	807
EREV PHEV30	2015	high	low	Midsize	CI	1637	23647	2780	0	2909	1169	1072	1734	263	151	0	71	75	81	85	807
EREV PHEV30	2015	high	low	Midsize	CNG	1608	22995	2747	0	1243	1153	1056	1734	1888	150	0	70	75	80	85	807
EREV PHEV30	2015	high	low	Midsize	E85	1548	21286	2688	0	1263	1115	1020	1734	295	102	0	68	75	79	85	807
EREV PHEV30	2015	high	low	Midsize	SI	1545	21746	2686	0	1730	1111	1019	1734	295	102	0	68	75	79	85	807

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
EREV PHEV40	2015	high	low	Midsize	CI	1668	23846	2925	0	2917	1188	1093	1734	263	151	0	73	75	108	85	807
EREV PHEV40	2015	high	low	Midsize	CNG	1639	23205	2897	0	1250	1175	1076	1734	1895	151	0	72	75	106	85	807
EREV PHEV40	2015	high	low	Midsize	E85	1577	21468	2821	0	1271	1133	1041	1734	295	103	0	69	75	104	85	807
EREV PHEV40	2015	high	low	Midsize	SI	1573	21926	2818	0	1738	1129	1039	1734	295	103	0	69	75	104	85	807
FC Series HEV	2015	high	low	Midsize		1466	23369	1537	4646	0	1321	0	695	2653	0	111	81	75	11	85	807
FC Series PHEV10	2015	high	low	Midsize		1496	23560	1472	4678	0	1388	0	695	2607	0	115	85	75	35	85	807
FC Series PHEV20	2015	high	low	Midsize		1532	24574	2425	4717	0	1388	0	695	2630	0	118	85	75	67	85	807
FC Series PHEV30	2015	high	low	Midsize		1564	25499	3134	4755	0	1379	0	695	2802	0	120	84	75	92	85	807
FC Series PHEV40	2015	high	low	Midsize		1597	25740	3284	4790	0	1379	0	695	2858	0	122	84	75	121	85	807
Split PHEV10	2015	high	low	Midsize	CI	1568	21654	1618	0	2935	819	957	1334	263	153	0	50	75	38	85	807
Split PHEV10	2015	high	low	Midsize	CNG	1531	20870	1531	0	1275	902	656	1334	1997	153	0	55	75	36	85	807
Split PHEV10	2015	high	low	Midsize	E85	1466	19030	1487	0	1292	819	634	1334	295	105	0	50	75	35	85	807
Split PHEV10	2015	high	low	Midsize	SI	1463	19493	1486	0	1759	818	633	1334	295	105	0	50	75	35	85	807
Split PHEV20	2015	high	low	Midsize	CI	1606	22756	2682	0	2945	819	978	1334	263	153	0	50	75	74	85	807
Split PHEV20	2015	high	low	Midsize	CNG	1566	21887	2515	0	1285	902	671	1334	2000	153	0	55	75	70	85	807
Split PHEV20	2015	high	low	Midsize	E85	1502	20046	2474	0	1301	819	649	1334	295	106	0	50	75	69	85	807
Split PHEV20	2015	high	low	Midsize	SI	1499	20508	2473	0	1768	818	648	1334	295	106	0	50	75	69	85	807
Split HEV	2015	high	low	Midsize	CI	1532	21082	1383	0	2918	752	919	1334	263	151	0	46	75	10	85	807
Split HEV	2015	high	low	Midsize	CNG	1505	20369	1229	0	1269	963	646	1334	1956	152	0	59	75	9	85	807
Split HEV	2015	high	low	Midsize	E85	1436	18659	1383	0	1276	798	611	1334	295	103	0	49	75	10	85	807
Split HEV	2015	high	low	Midsize	SI	1431	18959	1229	0	1743	787	609	1334	295	103	0	48	75	9	85	807
Conventional	2015	low	low	Midsize	CI	1579	17312	62	0	3050	0	0	1879	263	162	0		75	0	85	933
Conventional	2015	low	low	Midsize	CNG	1603	18010	62	0	1434	0	0	1701	3372	165	0		75	0	85	933
Conventional	2015	low	low	Midsize	E85	1506	14898	62	0	1439	0	0	1670	295	122	0		75	0	85	933
Conventional	2015	low	low	Midsize	SI	1511	14971	62	0	1481	0	0	1675	295	130	0		75	0	85	933
BEV100 DM	2015	low	low	Midsize		1558	21291	7375	0	0	1315	0	695	0	0	0	87	75	177	85	933
BEV100	2015	low	low	Midsize		1507	20914	7522	0	0	1487	0	0	0	0	0	98	0	180	85	933
BEV 200 DM	2015	low	low	Midsize		1688	29934	15773	0	0	1560	0	695	0	0	0	103	75	291	85	933

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
BEV 200	2015	low	low	Midsize		1637	29642	16038	0	0	1699	0	0	0	0	0	112	0	296	85	933
BEV300 DM	2015	low	low	Midsize		1878	39766	25434	0	0	1732	0	695	0	0	0	115	75	469	85	933
BEV300	2015	low	low	Midsize		1835	39838	26033	0	0	1900	0	0	0	0	0	126	0	480	85	933
EREV PHEV30	2015	low	low	Midsize	CI	1855	24656	4091	0	2978	1382	1259	1734	263	156	0	91	75	130	85	933
EREV PHEV30	2015	low	low	Midsize	CNG	1858	24673	4093	0	1320	1384	1261	1734	2502	156	0	92	75	130	85	933
EREV PHEV30	2015	low	low	Midsize	E85	1766	22225	3974	0	1332	1316	1203	1734	295	110	0	87	75	126	85	933
EREV PHEV30	2015	low	low	Midsize	SI	1763	22165	3969	0	1298	1296	1202	1734	295	110	0	86	75	126	85	933
EREV PHEV40	2015	low	low	Midsize	CI	1908	25043	4331	0	2990	1473	1293	1734	263	157	0	97	75	173	85	933
EREV PHEV40	2015	low	low	Midsize	CNG	1912	25080	4335	0	1333	1475	1295	1734	2522	157	0	98	75	173	85	933
EREV PHEV40	2015	low	low	Midsize	E85	1816	22585	4206	0	1345	1392	1237	1734	295	111	0	92	75	168	85	933
EREV PHEV40	2015	low	low	Midsize	SI	1814	22542	4203	0	1311	1388	1236	1734	295	111	0	92	75	168	85	933
FC Series HEV	2015	low	low	Midsize		1662	23482	1616	4888	0	1444	0	695	3150	0	125	96	75	20	85	933
FC Series PHEV10	2015	low	low	Midsize		1711	24134	2009	4938	0	1526	0	695	3078	0	132	101	75	59	85	933
FC Series PHEV20	2015	low	low	Midsize		1773	25619	3388	5000	0	1526	0	695	3120	0	136	101	75	116	85	933
FC Series PHEV30	2015	low	low	Midsize		1806	26855	4373	5037	0	1504	0	695	3341	0	139	99	75	139	85	933
FC Series PHEV40	2015	low	low	Midsize		1862	27308	4688	5092	0	1504	0	695	3423	0	142	99	75	188	85	933
Split PHEV10	2015	low	low	Midsize	CI	1749	21757	2247	0	2989	903	1078	1334	263	157	0	60	75	66	85	933
Split PHEV10	2015	low	low	Midsize	CNG	1733	21425	2134	0	1346	1000	764	1334	2472	158	0	66	75	63	85	933
Split PHEV10	2015	low	low	Midsize	E85	1642	19014	2047	0	1347	910	719	1334	295	111	0	60	75	60	85	933
Split PHEV10	2015	low	low	Midsize	SI	1640	18977	2047	0	1313	909	719	1334	295	111	0	60	75	60	85	933
Split PHEV20	2015	low	low	Midsize	CI	1817	23359	3787	0	3004	903	1112	1334	263	158	0	60	75	130	85	933
Split PHEV20	2015	low	low	Midsize	CNG	1796	22941	3587	0	1363	1000	789	1334	2487	159	0	66	75	123	85	933
Split PHEV20	2015	low	low	Midsize	E85	1703	20452	3447	0	1360	910	739	1334	295	113	0	60	75	118	85	933
Split PHEV20	2015	low	low	Midsize	SI	1701	20416	3447	0	1326	909	739	1334	295	113	0	60	75	118	85	933
Split HEV	2015	low	low	Midsize	CI	1692	20552	1401	0	2963	851	1019	1334	263	155	0	56	75	19	85	933
Split HEV	2015	low	low	Midsize	CNG	1687	20447	1401	0	1334	1049	744	1334	2416	157	0	69	75	18	85	933
Split HEV	2015	low	low	Midsize	E85	1598	18136	1401	0	1332	922	697	1334	295	110	0	61	75	18	85	933
Split HEV	2015	low	low	Midsize	SI	1594	18026	1347	0	1298	902	695	1334	295	110	0	60	75	17	85	933

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Conventional	2015	med	low	Midsize	CI	1485	17824	62	0	3020	0	0	1845	263	159	0		75	0	85	842
Conventional	2015	med	low	Midsize	CNG	1502	18436	62	0	1406	0	0	1681	3255	163	0		75	0	85	842
Conventional	2015	med	low	Midsize	E85	1412	15767	62	0	1734	0	0	1652	295	119	0		75	0	85	842
Conventional	2015	med	low	Midsize	SI	1416	15814	62	0	1762	0	0	1650	295	126	0		75	0	85	842
BEV100 DM	2015	med	low	Midsize		1425	21144	6739	0	0	1207	0	695	0	0	0	77	75	145	85	842
BEV100	2015	med	low	Midsize		1371	20718	6854	0	0	1361	0	0	0	0	0	86	0	147	85	842
BEV 200 DM	2015	med	low	Midsize		1535	28955	14330	0	0	1427	0	695	0	0	0	91	75	241	85	842
BEV 200	2015	med	low	Midsize		1480	28564	14517	0	0	1545	0	0	0	0	0	98	0	244	85	842
BEV300 DM	2015	med	low	Midsize		1685	37576	22830	0	0	1548	0	695	0	0	0	98	75	384	85	842
BEV300	2015	med	low	Midsize		1637	37495	23292	0	0	1700	0	0	0	0	0	108	0	391	85	842
EREV PHEV30	2015	med	low	Midsize	CI	1711	24441	3595	0	2937	1251	1148	1734	263	153	0	79	75	102	85	842
EREV PHEV30	2015	med	low	Midsize	CNG	1697	24129	3579	0	1274	1247	1140	1734	2196	153	0	79	75	101	85	842
EREV PHEV30	2015	med	low	Midsize	E85	1621	22053	3492	0	1291	1196	1094	1734	295	105	0	76	75	99	85	842
EREV PHEV30	2015	med	low	Midsize	SI	1618	22008	3490	0	1257	1188	1093	1734	295	105	0	75	75	99	85	842
EREV PHEV40	2015	med	low	Midsize	CI	1748	24735	3826	0	2946	1274	1172	1734	263	153	0	81	75	136	85	842
EREV PHEV40	2015	med	low	Midsize	CNG	1735	24423	3806	0	1284	1263	1164	1734	2211	153	0	80	75	135	85	842
EREV PHEV40	2015	med	low	Midsize	E85	1658	22318	3702	0	1300	1215	1118	1734	295	106	0	77	75	132	85	842
EREV PHEV40	2015	med	low	Midsize	SI	1656	22279	3701	0	1266	1213	1116	1734	295	106	0	77	75	132	85	842
FC Series HEV	2015	med	low	Midsize		1530	23540	1537	4743	0	1361	0	695	2917	0	116	86	75	14	85	842
FC Series PHEV10	2015	med	low	Midsize		1569	24093	1833	4785	0	1428	0	695	2864	0	122	91	75	44	85	842
FC Series PHEV20	2015	med	low	Midsize		1616	25426	3087	4835	0	1428	0	695	2894	0	125	91	75	87	85	842
FC Series PHEV30	2015	med	low	Midsize		1652	26578	4001	4876	0	1415	0	695	3088	0	128	90	75	113	85	842
FC Series PHEV40	2015	med	low	Midsize		1694	26905	4221	4919	0	1415	0	695	3152	0	131	90	75	150	85	842
Split PHEV10	2015	med	low	Midsize	CI	1624	21947	2042	0	2954	844	999	1334	263	154	0	54	75	49	85	842
Split PHEV10	2015	med	low	Midsize	CNG	1599	21397	1934	0	1303	931	698	1334	2242	155	0	59	75	47	85	842
Split PHEV10	2015	med	low	Midsize	E85	1520	19256	1862	0	1311	847	663	1334	295	107	0	54	75	45	85	842
Split PHEV10	2015	med	low	Midsize	SI	1518	19221	1863	0	1276	846	663	1334	295	107	0	54	75	45	85	842
Split PHEV20	2015	med	low	Midsize	CI	1674	23348	3410	0	2962	844	1017	1334	263	155	0	54	75	96	85	842

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Split PHEV20	2015	med	low	Midsize	CNG	1645	22731	3225	0	1315	931	716	1334	2249	156	0	59	75	91	85	842
Split PHEV20	2015	med	low	Midsize	E85	1565	20525	3110	0	1318	847	674	1334	295	108	0	54	75	88	85	842
Split PHEV20	2015	med	low	Midsize	SI	1563	20489	3110	0	1283	846	673	1334	295	108	0	54	75	88	85	842
Split HEV	2015	med	low	Midsize	CI	1580	20960	1383	0	2933	802	951	1334	263	152	0	51	75	13	85	842
Split HEV	2015	med	low	Midsize	CNG	1561	20566	1383	0	1293	942	682	1334	2181	154	0	60	75	12	85	842
Split HEV	2015	med	low	Midsize	E85	1484	18525	1383	0	1296	836	642	1334	295	106	0	53	75	12	85	842
Split HEV	2015	med	low	Midsize	SI	1480	18479	1383	0	1262	826	641	1334	295	105	0	52	75	12	85	842
Conventional	2020	high	low	Midsize	CI	1385	18391	62	0	3171	0	0	1727	250	156	0		75	0	85	746
Conventional	2020	high	low	Midsize	CNG	1380	19423	62	0	2359	0	0	1588	2791	160	0		75	0	85	746
Conventional	2020	high	low	Midsize	E85	1311	16883	62	0	2366	0	0	1561	281	115	0		75	0	85	746
Conventional	2020	high	low	Midsize	SI	1315	16965	62	0	2425	0	0	1563	281	122	0		75	0	85	746
BEV100 DM	2020	high	low	Midsize		1240	19693	5272	0	0	752	0	661	0	0	0	52	75	81	85	746
BEV100	2020	high	low	Midsize		1183	19243	5399	0	0	836	0	0	0	0	0	58	0	83	85	746
BEV 200 DM	2020	high	low	Midsize		1309	25581	11043	0	0	868	0	661	0	0	0	60	75	142	85	746
BEV 200	2020	high	low	Midsize		1249	25121	11191	0	0	921	0	0	0	0	0	64	0	143	85	746
BEV300 DM	2020	high	low	Midsize		1391	31756	17168	0	0	918	0	661	0	0	0	64	75	220	85	746
BEV300	2020	high	low	Midsize		1335	31489	17494	0	0	987	0	0	0	0	0	69	0	224	85	746
EREV PHEV30	2020	high	low	Midsize	CI	1518	22924	2537	0	3074	777	713	1649	250	149	0	54	75	57	85	746
EREV PHEV30	2020	high	low	Midsize	CNG	1475	22753	2472	0	2208	759	696	1649	1551	148	0	53	75	56	85	746
EREV PHEV30	2020	high	low	Midsize	E85	1429	21388	2399	0	2231	738	677	1649	281	99	0	51	75	56	85	746
EREV PHEV30	2020	high	low	Midsize	SI	1427	21379	2396	0	2228	736	676	1649	281	99	0	51	75	56	85	746
EREV PHEV40	2020	high	low	Midsize	CI	1538	23018	2604	0	3078	785	723	1649	250	149	0	55	75	76	85	746
EREV PHEV40	2020	high	low	Midsize	CNG	1495	22849	2540	0	2213	769	705	1649	1554	148	0	53	75	75	85	746
EREV PHEV40	2020	high	low	Midsize	E85	1448	21481	2469	0	2235	746	686	1649	281	99	0	52	75	73	85	746
EREV PHEV40	2020	high	low	Midsize	SI	1445	21467	2464	0	2233	741	685	1649	281	99	0	51	75	73	85	746
FC Series HEV	2020	high	low	Midsize		1355	21345	1229	3919	0	891	0	661	1770	0	101	62	75	8	85	746
FC Series PHEV10	2020	high	low	Midsize		1373	21328	1079	3935	0	926	0	661	1732	0	103	64	75	24	85	746
FC Series PHEV20	2020	high	low	Midsize		1398	21754	1471	3958	0	926	0	661	1743	0	105	64	75	46	85	746

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
FC Series PHEV30	2020	high	low	Midsize		1421	22603	2181	3983	0	922	0	661	1848	0	106	64	75	64	85	746
FC Series PHEV40	2020	high	low	Midsize		1446	23196	2725	4006	0	922	0	661	1873	0	108	64	75	85	85	746
Split PHEV10	2020	high	low	Midsize	CI	1466	20833	1097	0	3097	551	637	1269	250	150	0	38	75	26	85	746
Split PHEV10	2020	high	low	Midsize	CNG	1420	20669	1052	0	2239	605	435	1269	1653	150	0	42	75	25	85	746
Split PHEV10	2020	high	low	Midsize	E85	1369	19196	1012	0	2256	549	421	1269	281	102	0	38	75	24	85	746
Split PHEV10	2020	high	low	Midsize	SI	1367	19193	1012	0	2253	548	420	1269	281	102	0	38	75	24	85	746
Split PHEV20	2020	high	low	Midsize	CI	1493	21397	1629	0	3106	551	653	1269	250	151	0	38	75	51	85	746
Split PHEV20	2020	high	low	Midsize	CNG	1444	21146	1519	0	2242	605	439	1269	1654	151	0	42	75	47	85	746
Split PHEV20	2020	high	low	Midsize	E85	1394	19716	1507	0	2265	549	432	1269	281	103	0	38	75	47	85	746
Split PHEV20	2020	high	low	Midsize	SI	1392	19712	1506	0	2263	548	431	1269	281	103	0	38	75	47	85	746
Split HEV	2020	high	low	Midsize	CI	1443	20622	1093	0	3084	511	615	1269	250	149	0	36	75	7	85	746
Split HEV	2020	high	low	Midsize	CNG	1401	20535	1093	0	2231	593	426	1269	1630	150	0	41	75	7	85	746
Split HEV	2020	high	low	Midsize	E85	1348	19096	1093	0	2241	525	404	1269	281	100	0	36	75	8	85	746
Split HEV	2020	high	low	Midsize	SI	1346	19092	1093	0	2238	524	403	1269	281	100	0	36	75	8	85	746
Conventional	2020	low	low	Midsize	CI	1560	17090	62	0	2893	0	0	1784	250	161	0		75	0	85	916
Conventional	2020	low	low	Midsize	CNG	1578	17847	62	0	1356	0	0	1618	3292	164	0		75	0	85	916
Conventional	2020	low	low	Midsize	E85	1487	14816	62	0	1369	0	0	1594	281	122	0		75	0	85	916
Conventional	2020	low	low	Midsize	SI	1493	14872	62	0	1402	0	0	1594	281	130	0		75	0	85	916
BEV100 DM	2020	low	low	Midsize		1501	20115	6656	0	0	907	0	661	0	0	0	67	75	157	85	916
BEV100	2020	low	low	Midsize		1447	19692	6778	0	0	1024	0	0	0	0	0	76	0	159	85	916
BEV 200 DM	2020	low	low	Midsize		1612	27745	14124	0	0	1070	0	661	0	0	0	79	75	256	85	916
BEV 200	2020	low	low	Midsize		1557	27349	14298	0	0	1160	0	0	0	0	0	86	0	259	85	916
BEV300 DM	2020	low	low	Midsize		1772	36272	22551	0	0	1170	0	661	0	0	0	87	75	408	85	916
BEV300	2020	low	low	Midsize		1723	36161	22992	0	0	1278	0	0	0	0	0	95	0	416	85	916
EREV PHEV30	2020	low	low	Midsize	CI	1768	22557	3176	0	2813	938	862	1649	250	154	0	70	75	102	85	916
EREV PHEV30	2020	low	low	Midsize	CNG	1760	22487	3165	0	1234	940	857	1649	2310	154	0	70	75	101	85	916
EREV PHEV30	2020	low	low	Midsize	E85	1680	20255	3028	0	1248	901	823	1649	281	107	0	67	75	99	85	916
EREV PHEV30	2020	low	low	Midsize	SI	1676	20210	3021	0	1215	897	821	1649	281	107	0	66	75	99	85	916

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
EREV PHEV40	2020	low	low	Midsize	CI	1804	23168	3733	0	2822	960	879	1649	250	155	0	71	75	135	85	916
EREV PHEV40	2020	low	low	Midsize	CNG	1797	23115	3728	0	1243	954	876	1649	2329	155	0	71	75	135	85	916
EREV PHEV40	2020	low	low	Midsize	E85	1715	20896	3626	0	1257	914	840	1649	281	108	0	68	75	131	85	916
EREV PHEV40	2020	low	low	Midsize	SI	1712	20857	3622	0	1224	914	839	1649	281	108	0	68	75	131	85	916
FC Series HEV	2020	low	low	Midsize		1604	21344	1502	4180	0	1012	0	661	2234	0	122	75	75	14	85	916
FC Series PHEV10	2020	low	low	Midsize		1635	21285	1301	4206	0	1053	0	661	2188	0	127	78	75	40	85	916
FC Series PHEV20	2020	low	low	Midsize		1678	22178	2140	4243	0	1053	0	661	2206	0	130	78	75	79	85	916
FC Series PHEV30	2020	low	low	Midsize		1719	23248	3007	4281	0	1047	0	661	2361	0	133	78	75	109	85	916
FC Series PHEV40	2020	low	low	Midsize		1759	24316	3999	4314	0	1047	0	661	2405	0	136	78	75	144	85	916
Split PHEV10	2020	low	low	Midsize	CI	1679	19868	1302	0	2823	625	738	1269	250	155	0	46	75	45	85	916
Split PHEV10	2020	low	low	Midsize	CNG	1657	19592	1272	0	1257	689	518	1269	2259	156	0	51	75	43	85	916
Split PHEV10	2020	low	low	Midsize	E85	1578	17454	1209	0	1261	627	491	1269	281	109	0	46	75	41	85	916
Split PHEV10	2020	low	low	Midsize	SI	1575	17419	1209	0	1228	626	490	1269	281	109	0	46	75	41	85	916
Split PHEV20	2020	low	low	Midsize	CI	1724	20963	2368	0	2831	625	752	1269	250	156	0	46	75	88	85	916
Split PHEV20	2020	low	low	Midsize	CNG	1699	20599	2247	0	1267	689	530	1269	2264	157	0	51	75	83	85	916
Split PHEV20	2020	low	low	Midsize	E85	1620	18436	2170	0	1269	627	500	1269	281	110	0	46	75	81	85	916
Split PHEV20	2020	low	low	Midsize	SI	1617	18399	2168	0	1237	626	500	1269	281	110	0	46	75	81	85	916
Split HEV	2020	low	low	Midsize	CI	1640	19588	1229	0	2806	598	709	1269	250	154	0	44	75	12	85	916
Split HEV	2020	low	low	Midsize	CNG	1624	19376	1229	0	1249	712	509	1269	2204	155	0	53	75	11	85	916
Split HEV	2020	low	low	Midsize	E85	1547	17325	1229	0	1252	622	480	1269	281	108	0	46	75	11	85	916
Split HEV	2020	low	low	Midsize	SI	1542	17275	1229	0	1218	608	478	1269	281	108	0	45	75	11	85	916
Conventional	2020	med	low	Midsize	CI	1434	17951	62	0	2854	0	0	1905	250	158	0		75	0	85	793
Conventional	2020	med	low	Midsize	CNG	1440	18507	62	0	1310	0	0	1750	3073	160	0		75	0	85	793
Conventional	2020	med	low	Midsize	E85	1359	16137	62	0	1766	0	0	1724	281	116	0		75	0	85	793
Conventional	2020	med	low	Midsize	SI	1363	16183	62	0	1792	0	0	1724	281	123	0		75	0	85	793
BEV100 DM	2020	med	low	Midsize		1325	20035	5866	0	0	810	0	661	0	0	0	58	75	113	85	793
BEV100	2020	med	low	Midsize		1269	19563	5962	0	0	903	0	0	0	0	0	65	0	115	85	793
BEV 200 DM	2020	med	low	Midsize		1411	26675	12374	0	0	941	0	661	0	0	0	67	75	190	85	793

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
BEV 200	2020	med	low	Midsize		1354	26179	12466	0	0	1015	0	0	0	0	0	73	0	192	85	793
BEV300 DM	2020	med	low	Midsize		1527	33851	19479	0	0	1012	0	661	0	0	0	73	75	300	85	793
BEV300	2020	med	low	Midsize		1472	33534	19740	0	0	1096	0	0	0	0	0	79	0	304	85	793
EREV PHEV30	2020	med	low	Midsize	CI	1595	22673	2764	0	2768	837	768	1649	250	151	0	60	75	74	85	793
EREV PHEV30	2020	med	low	Midsize	CNG	1562	22006	2713	0	1182	823	754	1649	1766	150	0	59	75	73	85	793
EREV PHEV30	2020	med	low	Midsize	E85	1506	20401	2627	0	1202	798	731	1649	281	102	0	57	75	72	85	793
EREV PHEV30	2020	med	low	Midsize	SI	1504	20362	2623	0	1170	795	730	1649	281	102	0	57	75	72	85	793
EREV PHEV40	2020	med	low	Midsize	CI	1623	23195	3252	0	2773	850	779	1649	250	151	0	61	75	100	85	793
EREV PHEV40	2020	med	low	Midsize	CNG	1591	22513	3175	0	1188	838	767	1649	1774	151	0	60	75	98	85	793
EREV PHEV40	2020	med	low	Midsize	E85	1533	20947	3142	0	1207	810	741	1649	281	102	0	58	75	97	85	793
EREV PHEV40	2020	med	low	Midsize	SI	1531	20906	3138	0	1175	808	740	1649	281	102	0	58	75	97	85	793
FC Series HEV	2020	med	low	Midsize		1437	21503	1366	4020	0	930	0	661	1961	0	109	67	75	11	85	793
FC Series PHEV10	2020	med	low	Midsize		1458	21435	1172	4039	0	965	0	661	1914	0	112	69	75	30	85	793
FC Series PHEV20	2020	med	low	Midsize		1490	22188	1882	4069	0	965	0	661	1927	0	114	69	75	59	85	793
FC Series PHEV30	2020	med	low	Midsize		1520	23096	2624	4099	0	960	0	661	2053	0	116	69	75	81	85	793
FC Series PHEV40	2020	med	low	Midsize		1554	24098	3563	4129	0	960	0	661	2086	0	119	69	75	110	85	793
Split PHEV10	2020	med	low	Midsize	CI	1529	20354	1169	0	2784	573	671	1269	250	152	0	41	75	33	85	793
Split PHEV10	2020	med	low	Midsize	CNG	1493	19708	1130	0	1208	631	463	1269	1891	152	0	45	75	32	85	793
Split PHEV10	2020	med	low	Midsize	E85	1431	17975	1080	0	1221	572	444	1269	281	104	0	41	75	31	85	793
Split PHEV10	2020	med	low	Midsize	SI	1429	17942	1081	0	1188	572	444	1269	281	104	0	41	75	31	85	793
Split PHEV20	2020	med	low	Midsize	CI	1561	21271	2079	0	2786	573	675	1269	250	152	0	41	75	65	85	793
Split PHEV20	2020	med	low	Midsize	CNG	1524	20558	1961	0	1216	631	471	1269	1891	153	0	45	75	61	85	793
Split PHEV20	2020	med	low	Midsize	E85	1459	18801	1900	0	1223	572	447	1269	281	104	0	41	75	59	85	793
Split PHEV20	2020	med	low	Midsize	SI	1457	18768	1900	0	1191	572	447	1269	281	104	0	41	75	59	85	793
Split HEV	2020	med	low	Midsize	CI	1502	20219	1229	0	2772	540	651	1269	250	151	0	39	75	10	85	793
Split HEV	2020	med	low	Midsize	CNG	1470	19507	1093	0	1203	638	457	1269	1854	152	0	46	75	9	85	793
Split HEV	2020	med	low	Midsize	E85	1407	17836	1093	0	1211	566	433	1269	281	103	0	41	75	9	85	793
Split HEV	2020	med	low	Midsize	SI	1402	17772	1093	0	1174	548	427	1269	281	102	0	39	75	9	85	793

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Conventional	2025	high	low	Midsize	CI	1323	18825	62	0	3317	0	0	1702	237	155	0		75	0	85	685
Conventional	2025	high	low	Midsize	CNG	1312	19573	62	0	2403	0	0	1567	2557	158	0		75	0	85	685
Conventional	2025	high	low	Midsize	E85	1247	17265	62	0	2415	0	0	1545	267	112	0		75	0	85	685
Conventional	2025	high	low	Midsize	SI	1251	17344	62	0	2470	0	0	1548	267	119	0		75	0	85	685
BEV100 DM	2025	high	low	Midsize		1146	18295	3697	0	0	626	0	629	0	0	0	43	75	57	85	685
BEV100	2025	high	low	Midsize		1087	17809	3773	0	0	693	0	0	0	0	0	48	0	58	85	685
BEV 200 DM	2025	high	low	Midsize		1195	22381	7690	0	0	719	0	629	0	0	0	50	75	99	85	685
BEV 200	2025	high	low	Midsize		1133	21849	7752	0	0	754	0	0	0	0	0	52	0	100	85	685
BEV300 DM	2025	high	low	Midsize		1251	26558	11837	0	0	749	0	629	0	0	0	52	75	153	85	685
BEV300	2025	high	low	Midsize		1191	26124	11983	0	0	798	0	0	0	0	0	55	0	155	85	685
EREV PHEV30	2025	high	low	Midsize	CI	1426	22676	2196	0	3224	656	600	1568	237	147	0	46	75	44	85	685
EREV PHEV30	2025	high	low	Midsize	CNG	1376	22213	2125	0	2263	638	581	1568	1316	146	0	44	75	43	85	685
EREV PHEV30	2025	high	low	Midsize	E85	1335	21110	2085	0	2285	620	567	1568	267	96	0	43	75	42	85	685
EREV PHEV30	2025	high	low	Midsize	SI	1333	21073	2082	0	2255	618	566	1568	267	96	0	43	75	42	85	685
EREV PHEV40	2025	high	low	Midsize	CI	1441	22745	2245	0	3227	663	606	1568	237	147	0	46	75	59	85	685
EREV PHEV40	2025	high	low	Midsize	CNG	1392	22286	2176	0	2266	644	588	1568	1320	146	0	45	75	57	85	685
EREV PHEV40	2025	high	low	Midsize	E85	1351	21161	2118	0	2289	626	573	1568	267	96	0	43	75	57	85	685
EREV PHEV40	2025	high	low	Midsize	SI	1349	21125	2115	0	2258	624	572	1568	267	96	0	43	75	57	85	685
FC Series HEV	2025	high	low	Midsize		1257	20408	929	3367	0	750	0	629	1502	0	90	52	75	7	85	685
FC Series PHEV10	2025	high	low	Midsize		1270	20528	943	3378	0	778	0	629	1470	0	91	54	75	18	85	685
FC Series PHEV20	2025	high	low	Midsize		1289	20638	1030	3395	0	778	0	629	1476	0	92	54	75	36	85	685
FC Series PHEV30	2025	high	low	Midsize		1306	21577	1856	3413	0	774	0	629	1562	0	93	54	75	48	85	685
FC Series PHEV40	2025	high	low	Midsize		1323	21747	1994	3428	0	774	0	629	1580	0	94	54	75	64	85	685
Split PHEV10	2025	high	low	Midsize	CI	1387	20869	965	0	3246	473	538	1207	237	149	0	33	75	21	85	685
Split PHEV10	2025	high	low	Midsize	CNG	1334	20424	920	0	2291	517	365	1207	1402	148	0	36	75	19	85	685
Split PHEV10	2025	high	low	Midsize	E85	1291	19208	887	0	2309	469	353	1207	267	99	0	33	75	19	85	685
Split PHEV10	2025	high	low	Midsize	SI	1288	19175	886	0	2278	468	353	1207	267	99	0	33	75	19	85	685
Split PHEV20	2025	high	low	Midsize	CI	1407	21070	1152	0	3250	473	545	1207	237	149	0	33	75	40	85	685

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Split PHEV20	2025	high	low	Midsize	CNG	1352	20569	1068	0	2291	517	365	1207	1399	148	0	36	75	37	85	685
Split PHEV20	2025	high	low	Midsize	E85	1308	19364	1043	0	2309	469	353	1207	267	99	0	33	75	36	85	685
Split PHEV20	2025	high	low	Midsize	SI	1305	19332	1043	0	2278	468	353	1207	267	99	0	33	75	36	85	685
Split HEV	2025	high	low	Midsize	CI	1368	20654	929	0	3234	437	518	1207	237	148	0	30	75	7	85	685
Split HEV	2025	high	low	Midsize	CNG	1322	20210	813	0	2284	546	357	1207	1384	148	0	38	75	6	85	685
Split HEV	2025	high	low	Midsize	E85	1274	19101	929	0	2297	450	340	1207	267	97	0	31	75	7	85	685
Split HEV	2025	high	low	Midsize	SI	1271	18951	813	0	2267	445	341	1207	267	97	0	31	75	6	85	685
Conventional	2025	low	low	Midsize	CI	1543	16892	62	0	2746	0	0	1696	237	161	0		75	0	85	899
Conventional	2025	low	low	Midsize	CNG	1558	18155	62	0	1863	0	0	1540	3091	164	0		75	0	85	899
Conventional	2025	low	low	Midsize	E85	1469	15595	62	0	2161	0	0	1515	267	121	0		75	0	85	899
Conventional	2025	low	low	Midsize	SI	1474	15655	62	0	2195	0	0	1518	267	129	0		75	0	85	899
BEV100 DM	2025	low	low	Midsize		1427	18156	4810	0	0	782	0	629	0	0	0	58	75	109	85	899
BEV100	2025	low	low	Midsize		1371	17709	4897	0	0	876	0	0	0	0	0	65	0	111	85	899
BEV 200 DM	2025	low	low	Midsize		1503	23564	10102	0	0	898	0	629	0	0	0	67	75	176	85	899
BEV 200	2025	low	low	Midsize		1444	23104	10196	0	0	972	0	0	0	0	0	72	0	177	85	899
BEV300 DM	2025	low	low	Midsize		1606	29320	15799	0	0	956	0	629	0	0	0	71	75	275	85	899
BEV300	2025	low	low	Midsize		1550	28965	15990	0	0	1039	0	0	0	0	0	77	0	278	85	899
EREV PHEV30	2025	low	low	Midsize	CI	1716	21737	2843	0	2662	820	750	1568	237	153	0	61	75	85	85	899
EREV PHEV30	2025	low	low	Midsize	CNG	1700	22073	2817	0	1737	817	744	1568	2039	153	0	61	75	85	85	899
EREV PHEV30	2025	low	low	Midsize	E85	1628	20134	2704	0	1752	783	716	1568	267	106	0	58	75	83	85	899
EREV PHEV30	2025	low	low	Midsize	SI	1626	20097	2701	0	1722	781	715	1568	267	106	0	58	75	83	85	899
EREV PHEV40	2025	low	low	Midsize	CI	1748	21890	2957	0	2670	833	764	1568	237	154	0	62	75	114	85	899
EREV PHEV40	2025	low	low	Midsize	CNG	1732	22250	2945	0	1744	832	758	1568	2051	154	0	62	75	113	85	899
EREV PHEV40	2025	low	low	Midsize	E85	1658	20328	2858	0	1759	799	729	1568	267	107	0	59	75	110	85	899
EREV PHEV40	2025	low	low	Midsize	SI	1655	20288	2855	0	1728	796	727	1568	267	106	0	59	75	110	85	899
FC Series HEV	2025	low	low	Midsize		1558	20164	1161	3658	0	890	0	629	2002	0	118	66	75	12	85	899
FC Series PHEV10	2025	low	low	Midsize		1584	20300	1189	3678	0	922	0	629	1957	0	123	68	75	34	85	899
FC Series PHEV20	2025	low	low	Midsize		1619	20773	1619	3705	0	922	0	629	1974	0	125	68	75	66	85	899

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
FC Series PHEV30	2025	low	low	Midsize		1653	21716	2394	3735	0	918	0	629	2105	0	127	68	75	91	85	899
FC Series PHEV40	2025	low	low	Midsize		1690	22572	3186	3762	0	918	0	629	2141	0	130	68	75	123	85	899
Split PHEV10	2025	low	low	Midsize	CI	1642	19349	1183	0	2673	553	644	1207	237	154	0	41	75	38	85	899
Split PHEV10	2025	low	low	Midsize	CNG	1612	19464	1149	0	1757	609	448	1207	1947	155	0	45	75	36	85	899
Split PHEV10	2025	low	low	Midsize	E85	1542	17654	1097	0	1765	554	427	1207	267	107	0	41	75	34	85	899
Split PHEV10	2025	low	low	Midsize	SI	1540	17622	1097	0	1734	554	427	1207	267	107	0	41	75	34	85	899
Split PHEV20	2025	low	low	Midsize	CI	1678	19979	1796	0	2678	553	652	1207	237	155	0	41	75	73	85	899
Split PHEV20	2025	low	low	Midsize	CNG	1646	20044	1703	0	1765	609	457	1207	1953	155	0	45	75	69	85	899
Split PHEV20	2025	low	low	Midsize	E85	1576	18220	1648	0	1770	554	434	1207	267	108	0	41	75	67	85	899
Split PHEV20	2025	low	low	Midsize	SI	1574	18187	1648	0	1739	554	433	1207	267	108	0	41	75	67	85	899
Split HEV	2025	low	low	Midsize	CI	1609	19048	1045	0	2662	526	628	1207	237	153	0	39	75	10	85	899
Split HEV	2025	low	low	Midsize	CNG	1585	19227	1045	0	1750	623	441	1207	1917	154	0	46	75	10	85	899
Split HEV	2025	low	low	Midsize	E85	1515	17468	1045	0	1756	541	418	1207	267	106	0	40	75	10	85	899
Split HEV	2025	low	low	Midsize	SI	1511	17412	1045	0	1719	532	411	1207	267	105	0	39	75	11	85	899
Conventional	2025	med	low	Midsize	CI	1378	18276	62	0	3013	0	0	1797	237	156	0		75	0	85	739
Conventional	2025	med	low	Midsize	CNG	1380	19138	62	0	1944	0	0	1658	2838	159	0		75	0	85	739
Conventional	2025	med	low	Midsize	E85	1302	16833	62	0	2242	0	0	1634	267	114	0		75	0	85	739
Conventional	2025	med	low	Midsize	SI	1306	16903	62	0	2294	0	0	1634	267	121	0		75	0	85	739
BEV100 DM	2025	med	low	Midsize		1225	18432	4137	0	0	676	0	629	0	0	0	48	75	77	85	739
BEV100	2025	med	low	Midsize		1167	17937	4196	0	0	750	0	0	0	0	0	54	0	78	85	739
BEV 200 DM	2025	med	low	Midsize		1284	23044	8648	0	0	776	0	629	0	0	0	56	75	128	85	739
BEV 200	2025	med	low	Midsize		1223	22489	8677	0	0	821	0	0	0	0	0	59	0	129	85	739
BEV300 DM	2025	med	low	Midsize		1358	27846	13409	0	0	818	0	629	0	0	0	59	75	199	85	739
BEV300	2025	med	low	Midsize		1298	27352	13486	0	0	876	0	0	0	0	0	63	0	200	85	739
EREV PHEV30	2025	med	low	Midsize	CI	1508	22371	2410	0	2927	712	650	1568	237	149	0	51	75	60	85	739
EREV PHEV30	2025	med	low	Midsize	CNG	1469	21989	2352	0	1816	697	636	1568	1539	148	0	50	75	59	85	739
EREV PHEV30	2025	med	low	Midsize	E85	1417	20620	2280	0	1836	676	616	1568	267	99	0	48	75	58	85	739
EREV PHEV30	2025	med	low	Midsize	SI	1415	20583	2277	0	1805	674	616	1568	267	99	0	48	75	58	85	739

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
EREV PHEV40	2025	med	low	Midsize	CI	1529	22448	2463	0	2931	722	658	1568	237	149	0	52	75	80	85	739
EREV PHEV40	2025	med	low	Midsize	CNG	1491	22090	2408	0	1820	724	643	1568	1544	149	0	52	75	78	85	739
EREV PHEV40	2025	med	low	Midsize	E85	1438	20695	2335	0	1839	685	623	1568	267	100	0	49	75	76	85	739
EREV PHEV40	2025	med	low	Midsize	SI	1435	20657	2331	0	1809	682	622	1568	267	99	0	49	75	76	85	739
FC Series HEV	2025	med	low	Midsize		1351	20529	1045	3474	0	795	0	629	1707	0	103	57	75	9	85	739
FC Series PHEV10	2025	med	low	Midsize		1370	20612	1022	3490	0	826	0	629	1667	0	106	59	75	25	85	739
FC Series PHEV20	2025	med	low	Midsize		1396	20913	1290	3512	0	826	0	629	1678	0	108	59	75	49	85	739
FC Series PHEV30	2025	med	low	Midsize		1418	21793	2037	3534	0	821	0	629	1782	0	109	59	75	65	85	739
FC Series PHEV40	2025	med	low	Midsize		1444	22335	2532	3555	0	821	0	629	1808	0	111	59	75	87	85	739
Split PHEV10	2025	med	low	Midsize	CI	1456	20362	1035	0	2945	496	573	1207	237	150	0	36	75	28	85	739
Split PHEV10	2025	med	low	Midsize	CNG	1411	19951	993	0	1839	545	390	1207	1597	150	0	39	75	26	85	739
Split PHEV10	2025	med	low	Midsize	E85	1356	18525	952	0	1855	494	377	1207	267	101	0	35	75	25	85	739
Split PHEV10	2025	med	low	Midsize	SI	1354	18493	953	0	1824	493	377	1207	267	101	0	35	75	25	85	739
Split PHEV20	2025	med	low	Midsize	CI	1483	20778	1414	0	2955	496	590	1207	237	151	0	36	75	53	85	739
Split PHEV20	2025	med	low	Midsize	CNG	1439	20342	1345	0	1855	545	408	1207	1597	152	0	39	75	51	85	739
Split PHEV20	2025	med	low	Midsize	E85	1383	18902	1303	0	1865	494	389	1207	267	103	0	35	75	49	85	739
Split PHEV20	2025	med	low	Midsize	SI	1381	18869	1303	0	1834	493	388	1207	267	103	0	35	75	49	85	739
Split HEV	2025	med	low	Midsize	CI	1432	20085	929	0	2933	468	553	1207	237	149	0	34	75	8	85	739
Split HEV	2025	med	low	Midsize	CNG	1389	19715	929	0	1832	531	383	1207	1557	150	0	38	75	8	85	739
Split HEV	2025	med	low	Midsize	E85	1336	18347	929	0	1841	473	363	1207	267	100	0	34	75	8	85	739
Split HEV	2025	med	low	Midsize	SI	1334	18314	929	0	1810	472	362	1207	267	100	0	34	75	8	85	739
Conventional	2030	high	low	Midsize	CI	1253	18965	0	0	3131	40	0	1673	226	153	0	3	75	0	85	617
Conventional	2030	high	low	Midsize	CNG	1228	18840	0	0	2262	40	0	1548	1582	156	0	3	75	0	85	617
Conventional	2030	high	low	Midsize	E85	1176	17496	0	0	2273	40	0	1527	254	109	0	3	75	0	85	617
Conventional	2030	high	low	Midsize	SI	1179	17560	0	0	2320	40	0	1528	254	115	0	3	75	0	85	617
BEV100 DM	2030	high	low	Midsize		1064	17529	2671	0	0	514	0	598	0	0	0	36	75	50	85	617
BEV100	2030	high	low	Midsize		1003	17008	2694	0	0	568	0	0	0	0	0	39	0	51	85	617
BEV 200 DM	2030	high	low	Midsize		1104	20392	5463	0	0	585	0	598	0	0	0	41	75	85	85	617

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
BEV 200	2030	high	low	Midsize		1042	19871	5510	0	0	616	0	0	0	0	0	43	0	86	85	617
BEV300 DM	2030	high	low	Midsize		1151	23338	8387	0	0	608	0	598	0	0	0	42	75	131	85	617
BEV300	2030	high	low	Midsize		1091	22880	8486	0	0	649	0	0	0	0	0	45	0	133	85	617
EREV PHEV30	2030	high	low	Midsize	CI	1329	22204	1874	0	3043	541	492	1491	226	145	0	38	75	33	85	617
EREV PHEV30	2030	high	low	Midsize	CNG	1270	21251	1794	0	2126	526	472	1491	746	144	0	37	75	32	85	617
EREV PHEV30	2030	high	low	Midsize	E85	1239	20714	1754	0	2150	510	462	1491	254	93	0	35	75	32	85	617
EREV PHEV30	2030	high	low	Midsize	SI	1237	20707	1752	0	2147	509	461	1491	254	93	0	35	75	32	85	617
EREV PHEV40	2030	high	low	Midsize	CI	1340	22251	1909	0	3045	545	496	1491	226	145	0	38	75	44	85	617
EREV PHEV40	2030	high	low	Midsize	CNG	1280	21295	1830	0	2129	525	476	1491	748	144	0	36	75	43	85	617
EREV PHEV40	2030	high	low	Midsize	E85	1250	20759	1788	0	2152	514	466	1491	254	93	0	36	75	42	85	617
EREV PHEV40	2030	high	low	Midsize	SI	1248	20752	1786	0	2150	512	465	1491	254	93	0	36	75	42	85	617
FC Series HEV	2030	high	low	Midsize		1153	19687	765	2897	0	615	0	598	1173	0	79	43	75	6	85	617
FC Series PHEV10	2030	high	low	Midsize		1161	19831	807	2904	0	637	0	598	1151	0	79	44	75	14	85	617
FC Series PHEV20	2030	high	low	Midsize		1175	19854	814	2915	0	637	0	598	1156	0	80	44	75	27	85	617
FC Series PHEV30	2030	high	low	Midsize		1189	20688	1552	2930	0	633	0	598	1229	0	81	44	75	37	85	617
FC Series PHEV40	2030	high	low	Midsize		1201	20731	1576	2940	0	633	0	598	1238	0	82	44	75	48	85	617
Split PHEV10	2030	high	low	Midsize	CI	1301	20656	833	0	3065	397	444	1148	226	147	0	28	75	16	85	617
Split PHEV10	2030	high	low	Midsize	CNG	1238	19705	786	0	2154	432	299	1148	792	146	0	30	75	15	85	617
Split PHEV10	2030	high	low	Midsize	E85	1205	19108	762	0	2172	392	290	1148	254	96	0	27	75	15	85	617
Split PHEV10	2030	high	low	Midsize	SI	1202	19104	762	0	2169	391	289	1148	254	95	0	27	75	15	85	617
Split PHEV20	2030	high	low	Midsize	CI	1315	20674	841	0	3058	427	435	1148	226	146	0	30	75	30	85	617
Split PHEV20	2030	high	low	Midsize	CNG	1251	19712	794	0	2154	432	299	1148	790	146	0	30	75	28	85	617
Split PHEV20	2030	high	low	Midsize	E85	1219	19128	771	0	2167	415	285	1148	254	95	0	29	75	28	85	617
Split PHEV20	2030	high	low	Midsize	SI	1217	19122	771	0	2164	413	284	1148	254	95	0	29	75	28	85	617
Split HEV	2030	high	low	Midsize	CI	1285	20328	669	0	3052	369	426	1148	226	145	0	26	75	5	85	617
Split HEV	2030	high	low	Midsize	CNG	1225	19439	669	0	2144	415	288	1148	779	145	0	29	75	5	85	617
Split HEV	2030	high	low	Midsize	E85	1192	18879	669	0	2161	376	279	1148	254	94	0	26	75	6	85	617
Split HEV	2030	high	low	Midsize	SI	1190	18876	669	0	2159	376	279	1148	254	94	0	26	75	6	85	617

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Conventional	2030	low	low	Midsize	CI	1489	17045	62	0	2593	0	0	1747	226	159	0		75	0	85	848
Conventional	2030	low	low	Midsize	CNG	1497	17824	62	0	2330	0	0	1603	1932	162	0		75	0	85	848
Conventional	2030	low	low	Midsize	E85	1415	15956	62	0	2165	0	0	1583	254	118	0		75	0	85	848
Conventional	2030	low	low	Midsize	SI	1419	15988	62	0	2185	0	0	1579	254	125	0		75	0	85	848
BEV100 DM	2030	low	low	Midsize		1354	17083	3598	0	0	659	0	598	0	0	0	48	75	97	85	848
BEV100	2030	low	low	Midsize		1297	16625	3661	0	0	737	0	0	0	0	0	54	0	99	85	848
BEV 200 DM	2030	low	low	Midsize		1422	21104	7522	0	0	757	0	598	0	0	0	56	75	157	85	848
BEV 200	2030	low	low	Midsize		1362	20615	7572	0	0	816	0	0	0	0	0	60	0	158	85	848
BEV300 DM	2030	low	low	Midsize		1512	25346	11717	0	0	803	0	598	0	0	0	59	75	244	85	848
BEV300	2030	low	low	Midsize		1455	24946	11850	0	0	869	0	0	0	0	0	64	0	247	85	848
EREV PHEV30	2030	low	low	Midsize	CI	1630	21118	2478	0	2512	694	632	1491	226	152	0	51	75	71	85	848
EREV PHEV30	2030	low	low	Midsize	CNG	1604	21278	2438	0	2212	686	623	1491	1215	151	0	50	75	70	85	848
EREV PHEV30	2030	low	low	Midsize	E85	1542	20195	2351	0	2229	661	601	1491	254	103	0	49	75	69	85	848
EREV PHEV30	2030	low	low	Midsize	SI	1539	20160	2348	0	2199	659	600	1491	254	103	0	48	75	69	85	848
EREV PHEV40	2030	low	low	Midsize	CI	1656	21222	2553	0	2518	703	641	1491	226	152	0	52	75	95	85	848
EREV PHEV40	2030	low	low	Midsize	CNG	1631	21389	2516	0	2218	696	633	1491	1221	152	0	51	75	94	85	848
EREV PHEV40	2030	low	low	Midsize	E85	1567	20282	2411	0	2234	671	611	1491	254	104	0	49	75	92	85	848
EREV PHEV40	2030	low	low	Midsize	SI	1565	20246	2407	0	2205	669	610	1491	254	104	0	49	75	92	85	848
FC Series HEV	2030	low	low	Midsize		1482	19297	956	3200	0	758	0	598	1665	0	113	56	75	11	85	848
FC Series PHEV10	2030	low	low	Midsize		1499	19488	1057	3212	0	781	0	598	1624	0	116	57	75	26	85	848
FC Series PHEV20	2030	low	low	Midsize		1526	19753	1294	3231	0	781	0	598	1634	0	118	57	75	51	85	848
FC Series PHEV30	2030	low	low	Midsize		1559	20658	2048	3258	0	780	0	598	1747	0	120	57	75	76	85	848
FC Series PHEV40	2030	low	low	Midsize		1589	21012	2357	3279	0	780	0	598	1771	0	122	57	75	102	85	848
Split PHEV10	2030	low	low	Midsize	CI	1566	19035	1043	0	2522	472	543	1148	226	152	0	35	75	29	85	848
Split PHEV10	2030	low	low	Midsize	CNG	1528	19019	1008	0	2228	519	373	1148	1136	153	0	38	75	28	85	848
Split PHEV10	2030	low	low	Midsize	E85	1470	18038	966	0	2239	472	359	1148	254	105	0	35	75	27	85	848
Split PHEV10	2030	low	low	Midsize	SI	1467	18008	967	0	2210	471	358	1148	254	104	0	35	75	27	85	848
Split PHEV20	2030	low	low	Midsize	CI	1594	19439	1442	0	2524	472	546	1148	226	153	0	35	75	56	85	848

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Split PHEV20	2030	low	low	Midsize	CNG	1554	19388	1364	0	2233	519	379	1148	1134	153	0	38	75	53	85	848
Split PHEV20	2030	low	low	Midsize	E85	1496	18405	1326	0	2243	472	362	1148	254	105	0	35	75	52	85	848
Split PHEV20	2030	low	low	Midsize	SI	1494	18374	1325	0	2213	471	362	1148	254	105	0	35	75	52	85	848
Split HEV	2030	low	low	Midsize	CI	1544	18703	860	0	2513	448	530	1148	226	152	0	33	75	10	85	848
Split HEV	2030	low	low	Midsize	CNG	1509	18680	765	0	2224	548	369	1148	1116	152	0	40	75	9	85	848
Split HEV	2030	low	low	Midsize	E85	1450	17794	860	0	2228	456	347	1148	254	103	0	34	75	10	85	848
Split HEV	2030	low	low	Midsize	SI	1447	17763	860	0	2199	455	347	1148	254	103	0	33	75	10	85	848
Conventional	2030	med	low	Midsize	CI	1325	18156	0	0	2820	40	0	1663	226	152	0	3	75	0	85	691
Conventional	2030	med	low	Midsize	CNG	1320	18591	0	0	2278	40	0	1565	1781	157	0	3	75	0	85	691
Conventional	2030	med	low	Midsize	E85	1251	16870	0	0	2110	40	0	1543	254	111	0	3	75	0	85	691
Conventional	2030	med	low	Midsize	SI	1254	16932	0	0	2156	40	0	1543	254	117	0	3	75	0	85	691
BEV100 DM	2030	med	low	Midsize		1162	17532	3105	0	0	568	0	598	0	0	0	41	75	69	85	691
BEV100	2030	med	low	Midsize		1101	16999	3108	0	0	629	0	0	0	0	0	45	0	69	85	691
BEV 200 DM	2030	med	low	Midsize		1213	20903	6391	0	0	653	0	598	0	0	0	47	75	114	85	691
BEV 200	2030	med	low	Midsize		1150	20346	6397	0	0	688	0	0	0	0	0	49	0	114	85	691
BEV300 DM	2030	med	low	Midsize		1277	24425	9880	0	0	685	0	598	0	0	0	49	75	176	85	691
BEV300	2030	med	low	Midsize		1216	23912	9921	0	0	730	0	0	0	0	0	52	0	177	85	691
EREV PHEV30	2030	med	low	Midsize	CI	1430	21807	2103	0	2765	599	545	1491	226	147	0	43	75	48	85	691
EREV PHEV30	2030	med	low	Midsize	CNG	1383	21338	2039	0	2159	583	529	1491	913	146	0	42	75	48	85	691
EREV PHEV30	2030	med	low	Midsize	E85	1341	20610	1983	0	2180	567	515	1491	254	97	0	40	75	47	85	691
EREV PHEV30	2030	med	low	Midsize	SI	1339	20603	1980	0	2178	565	514	1491	254	97	0	40	75	47	85	691
EREV PHEV40	2030	med	low	Midsize	CI	1447	21878	2155	0	2769	606	551	1491	226	148	0	43	75	64	85	691
EREV PHEV40	2030	med	low	Midsize	CNG	1400	21412	2089	0	2162	591	535	1491	918	147	0	42	75	63	85	691
EREV PHEV40	2030	med	low	Midsize	E85	1357	20675	2031	0	2183	573	521	1491	254	97	0	41	75	62	85	691
EREV PHEV40	2030	med	low	Midsize	SI	1354	20666	2028	0	2181	571	520	1491	254	97	0	41	75	61	85	691
FC Series HEV	2030	med	low	Midsize		1272	19683	860	3023	0	670	0	598	1378	0	95	48	75	8	85	691
FC Series PHEV10	2030	med	low	Midsize		1286	19824	900	3034	0	694	0	598	1349	0	97	50	75	20	85	691
FC Series PHEV20	2030	med	low	Midsize		1306	19893	947	3049	0	694	0	598	1356	0	98	50	75	38	85	691

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
FC Series PHEV30	2030	med	low	Midsize		1324	20816	1755	3067	0	691	0	598	1445	0	99	49	75	52	85	691
FC Series PHEV40	2030	med	low	Midsize		1344	20881	1789	3082	0	691	0	598	1461	0	101	49	75	69	85	691
Split PHEV10	2030	med	low	Midsize	CI	1388	20055	912	0	2783	425	482	1148	226	149	0	30	75	22	85	691
Split PHEV10	2030	med	low	Midsize	CNG	1336	19548	869	0	2181	464	326	1148	937	148	0	33	75	21	85	691
Split PHEV10	2030	med	low	Midsize	E85	1292	18791	838	0	2198	421	316	1148	254	99	0	30	75	20	85	691
Split PHEV10	2030	med	low	Midsize	SI	1290	18788	839	0	2195	420	316	1148	254	99	0	30	75	20	85	691
Split PHEV20	2030	med	low	Midsize	CI	1409	20219	1060	0	2787	425	489	1148	226	149	0	30	75	42	85	691
Split PHEV20	2030	med	low	Midsize	CNG	1354	19662	984	0	2181	464	326	1148	936	148	0	33	75	39	85	691
Split PHEV20	2030	med	low	Midsize	E85	1310	18916	963	0	2198	421	316	1148	254	99	0	30	75	38	85	691
Split PHEV20	2030	med	low	Midsize	SI	1308	18912	963	0	2195	420	316	1148	254	99	0	30	75	38	85	691
Split HEV	2030	med	low	Midsize	CI	1370	19747	765	0	2771	399	464	1148	226	148	0	29	75	7	85	691
Split HEV	2030	med	low	Midsize	CNG	1323	19266	669	0	2174	506	319	1148	926	148	0	36	75	6	85	691
Split HEV	2030	med	low	Midsize	E85	1276	18577	765	0	2186	404	304	1148	254	97	0	29	75	8	85	691
Split HEV	2030	med	low	Midsize	SI	1274	18574	765	0	2184	403	304	1148	254	97	0	29	75	8	85	691
Conventional	2045	high	low	Midsize	CI	1183	18510	0	0	2676	35	0	1419	194	151	0	3	75	0	85	549
Conventional	2045	high	low	Midsize	CNG	1150	18485	0	0	1927	35	0	1317	1434	154	0	3	75	0	85	549
Conventional	2045	high	low	Midsize	E85	1104	17250	0	0	1934	35	0	1296	218	106	0	3	75	0	85	549
Conventional	2045	high	low	Midsize	SI	1108	17310	0	0	1975	35	0	1300	218	112	0	3	75	0	85	549
BEV100 DM	2045	high	low	Midsize		987	17202	2195	0	0	419	0	514	0	0	0	30	75	47	85	549
BEV100	2045	high	low	Midsize		926	16751	2217	0	0	460	0	0	0	0	0	33	0	48	85	549
BEV 200 DM	2045	high	low	Midsize		1024	19563	4498	0	0	477	0	514	0	0	0	34	75	80	85	549
BEV 200	2045	high	low	Midsize		962	19099	4525	0	0	500	0	0	0	0	0	36	0	81	85	549
BEV300 DM	2045	high	low	Midsize		1068	21984	6900	0	0	496	0	514	0	0	0	35	75	123	85	549
BEV300	2045	high	low	Midsize		1007	21568	6968	0	0	526	0	0	0	0	0	38	0	124	85	549
EREV PHEV30	2045	high	low	Midsize	CI	1241	21230	1566	0	2601	444	401	1282	194	143	0	32	75	26	85	549
EREV PHEV30	2045	high	low	Midsize	CNG	1173	20371	1488	0	1812	423	382	1282	617	142	0	30	75	25	85	549
EREV PHEV30	2045	high	low	Midsize	E85	1151	19950	1460	0	1833	416	375	1282	218	90	0	30	75	25	85	549
EREV PHEV30	2045	high	low	Midsize	SI	1148	19942	1457	0	1831	415	374	1282	218	90	0	30	75	25	85	549

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
EREV PHEV40	2045	high	low	Midsize	CI	1249	21260	1588	0	2602	447	403	1282	194	143	0	32	75	34	85	549
EREV PHEV40	2045	high	low	Midsize	CNG	1181	20403	1509	0	1813	425	384	1282	622	142	0	30	75	33	85	549
EREV PHEV40	2045	high	low	Midsize	E85	1159	19981	1484	0	1834	418	378	1282	218	90	0	30	75	33	85	549
EREV PHEV40	2045	high	low	Midsize	SI	1156	19972	1480	0	1832	417	377	1282	218	90	0	30	75	33	85	549
FC Series HEV	2045	high	low	Midsize		1050	19215	598	2609	0	495	0	514	1022	0	61	35	75	5	85	549
FC Series PHEV10	2045	high	low	Midsize		1056	19375	671	2613	0	511	0	514	1002	0	61	36	75	11	85	549
FC Series PHEV20	2045	high	low	Midsize		1067	19391	676	2622	0	511	0	514	1005	0	62	36	75	21	85	549
FC Series PHEV30	2045	high	low	Midsize		1078	20078	1272	2635	0	507	0	514	1075	0	63	36	75	28	85	549
FC Series PHEV40	2045	high	low	Midsize		1087	20107	1287	2642	0	507	0	514	1083	0	63	36	75	37	85	549
Split PHEV10	2045	high	low	Midsize	CI	1217	19936	703	0	2618	327	362	987	194	145	0	23	75	12	85	549
Split PHEV10	2045	high	low	Midsize	CNG	1149	19099	658	0	1833	354	242	987	659	144	0	25	75	12	85	549
Split PHEV10	2045	high	low	Midsize	E85	1122	18611	641	0	1843	336	227	987	218	92	0	24	75	11	85	549
Split PHEV10	2045	high	low	Midsize	SI	1119	18606	640	0	1840	334	227	987	218	92	0	24	75	11	85	549
Split PHEV20	2045	high	low	Midsize	CI	1230	19959	709	0	2612	364	353	987	194	144	0	26	75	24	85	549
Split PHEV20	2045	high	low	Midsize	CNG	1159	19102	664	0	1833	354	242	987	656	144	0	25	75	22	85	549
Split PHEV20	2045	high	low	Midsize	E85	1133	18627	647	0	1845	340	230	987	218	92	0	24	75	22	85	549
Split PHEV20	2045	high	low	Midsize	SI	1130	18622	646	0	1843	339	229	987	218	92	0	24	75	22	85	549
Split HEV	2045	high	low	Midsize	CI	1207	19690	598	0	2608	305	347	987	194	144	0	22	75	5	85	549
Split HEV	2045	high	low	Midsize	CNG	1142	18855	512	0	1824	372	232	987	649	143	0	27	75	4	85	549
Split HEV	2045	high	low	Midsize	E85	1113	18448	598	0	1841	305	226	987	218	91	0	22	75	5	85	549
Split HEV	2045	high	low	Midsize	SI	1109	18438	598	0	1839	298	225	987	218	91	0	21	75	5	85	549
Conventional	2045	low	low	Midsize	CI	1434	16849	0	0	2562	35	0	1474	194	155	0	3	75	0	85	797
Conventional	2045	low	low	Midsize	CNG	1431	17315	0	0	1983	35	0	1378	1760	159	0	3	75	0	85	797
Conventional	2045	low	low	Midsize	E85	1361	15610	0	0	1841	35	0	1361	218	115	0	3	75	0	85	797
Conventional	2045	low	low	Midsize	SI	1364	15663	0	0	1881	35	0	1359	218	121	0	3	75	0	85	797
BEV100 DM	2045	low	low	Midsize		1279	16517	3014	0	0	546	0	514	0	0	0	41	75	80	85	797
BEV100	2045	low	low	Midsize		1219	16078	3028	0	0	608	0	0	0	0	0	46	0	80	85	797
BEV 200 DM	2045	low	low	Midsize		1331	19768	6186	0	0	625	0	514	0	0	0	47	75	126	85	797

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
BEV 200	2045	low	low	Midsize		1270	19310	6206	0	0	661	0	0	0	0	0	50	0	127	85	797
BEV300 DM	2045	low	low	Midsize		1402	23173	9560	0	0	656	0	514	0	0	0	49	75	195	85	797
BEV300	2045	low	low	Midsize		1343	22787	9641	0	0	703	0	0	0	0	0	53	0	197	85	797
EREV PHEV30	2045	low	low	Midsize	CI	1550	20382	2114	0	2517	578	528	1282	194	150	0	43	75	58	85	797
EREV PHEV30	2045	low	low	Midsize	CNG	1512	20107	2065	0	1886	566	516	1282	1025	149	0	43	75	58	85	797
EREV PHEV30	2045	low	low	Midsize	E85	1463	19223	2005	0	1903	550	501	1282	218	101	0	41	75	57	85	797
EREV PHEV30	2045	low	low	Midsize	SI	1461	19216	2002	0	1901	548	501	1282	218	101	0	41	75	57	85	797
EREV PHEV40	2045	low	low	Midsize	CI	1573	20444	2155	0	2521	586	534	1282	194	151	0	44	75	79	85	797
EREV PHEV40	2045	low	low	Midsize	CNG	1533	20174	2108	0	1890	573	523	1282	1029	150	0	43	75	77	85	797
EREV PHEV40	2045	low	low	Midsize	E85	1484	19282	2047	0	1907	555	508	1282	218	102	0	42	75	76	85	797
EREV PHEV40	2045	low	low	Midsize	SI	1480	19276	2044	0	1904	555	507	1282	218	101	0	42	75	75	85	797
FC Series HEV	2045	low	low	Midsize		1399	18643	768	2915	0	636	0	514	1464	0	106	48	75	8	85	797
FC Series PHEV10	2045	low	low	Midsize		1415	18871	913	2926	0	656	0	514	1431	0	108	49	75	23	85	797
FC Series PHEV20	2045	low	low	Midsize		1440	19064	1083	2943	0	656	0	514	1438	0	110	49	75	45	85	797
FC Series PHEV30	2045	low	low	Midsize		1463	19853	1749	2961	0	653	0	514	1534	0	111	49	75	62	85	797
FC Series PHEV40	2045	low	low	Midsize		1488	20060	1921	2977	0	653	0	514	1552	0	113	49	75	84	85	797
Split PHEV10	2045	low	low	Midsize	CI	1500	18623	899	0	2526	399	455	987	194	151	0	30	75	26	85	797
Split PHEV10	2045	low	low	Midsize	CNG	1447	18143	859	0	1899	438	309	987	890	151	0	33	75	24	85	797
Split PHEV10	2045	low	low	Midsize	E85	1405	17402	831	0	1912	398	300	987	218	102	0	30	75	24	85	797
Split PHEV10	2045	low	low	Midsize	SI	1402	17398	831	0	1910	397	299	987	218	102	0	30	75	24	85	797
Split PHEV20	2045	low	low	Midsize	CI	1524	18935	1210	0	2526	399	455	987	194	151	0	30	75	50	85	797
Split PHEV20	2045	low	low	Midsize	CNG	1470	18427	1141	0	1901	438	312	987	887	151	0	33	75	47	85	797
Split PHEV20	2045	low	low	Midsize	E85	1428	17690	1117	0	1913	398	301	987	218	103	0	30	75	46	85	797
Split PHEV20	2045	low	low	Midsize	SI	1425	17686	1116	0	1911	397	300	987	218	102	0	30	75	46	85	797
Split HEV	2045	low	low	Midsize	CI	1478	18274	683	0	2517	380	441	987	194	150	0	29	75	7	85	797
Split HEV	2045	low	low	Midsize	CNG	1428	17857	683	0	1894	441	304	987	876	150	0	33	75	7	85	797
Split HEV	2045	low	low	Midsize	E85	1385	17143	683	0	1905	389	293	987	218	101	0	29	75	7	85	797
Split HEV	2045	low	low	Midsize	SI	1384	17129	683	0	1901	383	290	987	218	101	0	29	75	8	85	797

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Conventional	2045	med	low	Midsize	CI	1267	18041	0	0	2700	35	0	1448	194	153	0	3	75	0	85	631
Conventional	2045	med	low	Midsize	CNG	1244	18104	0	0	1954	35	0	1339	1535	156	0	3	75	0	85	631
Conventional	2045	med	low	Midsize	E85	1190	16619	0	0	1811	35	0	1320	218	110	0	3	75	0	85	631
Conventional	2045	med	low	Midsize	SI	1195	16676	0	0	1852	35	0	1321	218	117	0	3	75	0	85	631
BEV100 DM	2045	med	low	Midsize		1087	17073	2558	0	0	467	0	514	0	0	0	34	75	61	85	631
BEV100	2045	med	low	Midsize		1026	16613	2565	0	0	515	0	0	0	0	0	38	0	61	85	631
BEV 200 DM	2045	med	low	Midsize		1131	19835	5255	0	0	532	0	514	0	0	0	39	75	100	85	631
BEV 200	2045	med	low	Midsize		1068	19341	5248	0	0	560	0	0	0	0	0	41	0	100	85	631
BEV300 DM	2045	med	low	Midsize		1187	22700	8094	0	0	559	0	514	0	0	0	41	75	154	85	631
BEV300	2045	med	low	Midsize		1125	22245	8118	0	0	593	0	0	0	0	0	43	0	155	85	631
EREV PHEV30	2045	med	low	Midsize	CI	1346	21046	1775	0	2628	494	450	1282	194	146	0	36	75	38	85	631
EREV PHEV30	2045	med	low	Midsize	CNG	1290	20348	1705	0	1840	477	433	1282	771	145	0	35	75	37	85	631
EREV PHEV30	2045	med	low	Midsize	E85	1256	19751	1664	0	1860	466	424	1282	218	94	0	34	75	36	85	631
EREV PHEV30	2045	med	low	Midsize	SI	1253	19742	1661	0	1858	464	423	1282	218	94	0	34	75	36	85	631
EREV PHEV40	2045	med	low	Midsize	CI	1358	21092	1810	0	2630	498	454	1282	194	146	0	36	75	50	85	631
EREV PHEV40	2045	med	low	Midsize	CNG	1302	20395	1741	0	1842	481	437	1282	772	145	0	35	75	49	85	631
EREV PHEV40	2045	med	low	Midsize	E85	1269	19799	1701	0	1862	470	428	1282	218	95	0	34	75	48	85	631
EREV PHEV40	2045	med	low	Midsize	SI	1266	19790	1697	0	1860	469	427	1282	218	95	0	34	75	48	85	631
FC Series HEV	2045	med	low	Midsize		1174	19134	683	2736	0	549	0	514	1215	0	79	40	75	6	85	631
FC Series PHEV10	2045	med	low	Midsize		1185	19296	759	2744	0	568	0	514	1189	0	80	42	75	16	85	631
FC Series PHEV20	2045	med	low	Midsize		1201	19335	781	2756	0	568	0	514	1194	0	81	42	75	30	85	631
FC Series PHEV30	2045	med	low	Midsize		1214	20122	1466	2770	0	564	0	514	1276	0	82	41	75	40	85	631
FC Series PHEV40	2045	med	low	Midsize		1229	20166	1487	2780	0	564	0	514	1287	0	83	41	75	53	85	631
Split PHEV10	2045	med	low	Midsize	CI	1313	19575	777	0	2642	354	398	987	194	147	0	26	75	18	85	631
Split PHEV10	2045	med	low	Midsize	CNG	1253	18844	735	0	1859	386	268	987	774	147	0	28	75	17	85	631
Split PHEV10	2045	med	low	Midsize	E85	1218	18232	712	0	1874	350	260	987	218	96	0	26	75	16	85	631
Split PHEV10	2045	med	low	Midsize	SI	1215	18228	712	0	1872	349	259	987	218	96	0	26	75	16	85	631
Split PHEV20	2045	med	low	Midsize	CI	1331	19683	869	0	2637	384	391	987	194	147	0	28	75	34	85	631

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Split PHEV20	2045	med	low	Midsize	CNG	1268	18925	817	0	1859	386	268	987	772	147	0	28	75	32	85	631
Split PHEV20	2045	med	low	Midsize	E85	1234	18337	802	0	1871	373	257	987	218	96	0	27	75	31	85	631
Split PHEV20	2045	med	low	Midsize	SI	1231	18330	801	0	1869	370	256	987	218	96	0	27	75	31	85	631
Split HEV	2045	med	low	Midsize	CI	1296	19255	598	0	2631	333	382	987	194	146	0	24	75	5	85	631
Split HEV	2045	med	low	Midsize	CNG	1239	18584	598	0	1851	377	260	987	765	146	0	28	75	5	85	631
Split HEV	2045	med	low	Midsize	E85	1205	17998	598	0	1865	336	251	987	218	95	0	25	75	6	85	631
Split HEV	2045	med	low	Midsize	SI	1202	17994	598	0	1863	336	250	987	218	95	0	25	75	6	85	631
Conventional	2010	low	med	Midsize	CI	1647	16290	52	0	2736	0	0	1749	234	163	0		75	0	85	1000
Conventional	2010	low	med	Midsize	CNG	1704	17338	52	0	1300	0	0	1582	3446	167	0		75	0	85	1000
Conventional	2010	low	med	Midsize	E85	1574	14119	52	0	1303	0	0	1552	263	124	0		75	0	85	1000
Conventional	2010	low	med	Midsize	SI	1580	14167	52	0	1333	0	0	1550	263	132	0		75	0	85	1000
BEV100 DM	2010	low	med	Midsize		1671	21961	7840	0	0	1919	0	636	0	0	0	94	75	216	85	1000
BEV100	2010	low	med	Midsize		1621	21734	8009	0	0	2159	0	0	0	0	0	105	0	220	85	1000
BEV 200 DM	2010	low	med	Midsize		1830	31421	16931	0	0	2288	0	636	0	0	0	111	75	358	85	1000
BEV 200	2010	low	med	Midsize		1784	31345	17279	0	0	2499	0	0	0	0	0	122	0	366	85	1000
BEV300 DM	2010	low	med	Midsize		2072	42435	27678	0	0	2555	0	636	0	0	0	125	75	586	85	1000
BEV300	2010	low	med	Midsize		2043	43067	28617	0	0	2884	0	0	0	0	0	141	0	606	85	1000
EREV PHEV30	2010	low	med	Midsize	CI	1970	27023	6140	0	2676	2060	1802	1585	234	158	0	100	75	162	85	1000
EREV PHEV30	2010	low	med	Midsize	CNG	2020	27871	6232	0	1209	2127	1843	1585	2864	159	0	104	75	165	85	1000
EREV PHEV30	2010	low	med	Midsize	E85	1881	24732	5998	0	1211	1948	1728	1585	263	113	0	95	75	159	85	1000
EREV PHEV30	2010	low	med	Midsize	SI	1876	24682	5989	0	1180	1941	1725	1585	263	112	0	95	75	158	85	1000
EREV PHEV40	2010	low	med	Midsize	CI	2039	27973	6822	0	2691	2241	1862	1585	234	159	0	109	75	218	85	1000
EREV PHEV40	2010	low	med	Midsize	CNG	2092	28923	6949	0	1225	2315	1907	1585	2925	160	0	113	75	222	85	1000
EREV PHEV40	2010	low	med	Midsize	E85	1945	25592	6617	0	1225	2113	1785	1585	263	114	0	103	75	211	85	1000
EREV PHEV40	2010	low	med	Midsize	SI	1942	25547	6611	0	1194	2107	1782	1585	263	114	0	103	75	211	85	1000
FC Series HEV	2010	low	med	Midsize		1763	25284	1724	5722	0	2040	0	636	3869	0	131	99	75	22	85	1000
FC Series PHEV10	2010	low	med	Midsize		1833	26870	2908	5802	0	2184	0	636	3797	0	140	106	75	79	85	1000
FC Series PHEV20	2010	low	med	Midsize		1920	29176	5052	5898	0	2184	0	636	3863	0	146	106	75	157	85	1000

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
FC Series PHEV30	2010	low	med	Midsize		1949	31031	6589	5934	0	2139	0	636	4166	0	148	104	75	174	85	1000
FC Series PHEV40	2010	low	med	Midsize		2024	32122	7432	6016	0	2185	0	636	4288	0	154	106	75	237	85	1000
Split PHEV10	2010	low	med	Midsize	CI	1847	22729	3239	0	2688	1286	1549	1220	234	159	0	63	75	88	85	1000
Split PHEV10	2010	low	med	Midsize	CNG	1873	23009	3116	0	1237	1429	1124	1220	2883	161	0	70	75	84	85	1000
Split PHEV10	2010	low	med	Midsize	E85	1739	19975	2945	0	1227	1299	1038	1220	263	115	0	63	75	80	85	1000
Split PHEV10	2010	low	med	Midsize	SI	1736	19938	2943	0	1196	1297	1036	1220	263	115	0	63	75	80	85	1000
Split PHEV20	2010	low	med	Midsize	CI	1940	25222	5632	0	2707	1286	1615	1220	234	161	0	63	75	175	85	1000
Split PHEV20	2010	low	med	Midsize	CNG	1960	25389	5398	0	1258	1429	1172	1220	2902	163	0	70	75	167	85	1000
Split PHEV20	2010	low	med	Midsize	E85	1820	22192	5101	0	1243	1299	1076	1220	263	117	0	63	75	158	85	1000
Split PHEV20	2010	low	med	Midsize	SI	1817	22161	5104	0	1212	1297	1075	1220	263	117	0	63	75	158	85	1000
Split HEV	2010	low	med	Midsize	CI	1765	20442	1455	0	2658	1195	1445	1220	234	156	0	58	75	19	85	1000
Split HEV	2010	low	med	Midsize	CNG	1805	21104	1509	0	1221	1534	1086	1220	2791	160	0	75	75	19	85	1000
Split HEV	2010	low	med	Midsize	E85	1673	18236	1509	0	1208	1316	995	1220	263	112	0	64	75	19	85	1000
Split HEV	2010	low	med	Midsize	SI	1669	18138	1455	0	1178	1305	993	1220	263	112	0	64	75	18	85	1000
Conventional	2015	high	med	Midsize	CI	1450	16798	52	0	2554	0	0	1275	223	159	0		75	0	85	807
Conventional	2015	high	med	Midsize	CNG	1452	17518	52	0	1177	0	0	1138	2973	161	0		75	0	85	807
Conventional	2015	high	med	Midsize	E85	1375	15723	52	0	2130	0	0	1118	250	118	0		75	0	85	807
Conventional	2015	high	med	Midsize	SI	1381	15789	52	0	2166	0	0	1125	250	126	0		75	0	85	807
BEV100 DM	2015	high	med	Midsize		1361	19893	5516	0	0	1060	0	605	0	0	0	70	75	123	85	807
BEV100	2015	high	med	Midsize		1307	19570	5664	0	0	1194	0	0	0	0	0	78	0	126	85	807
BEV 200 DM	2015	high	med	Midsize		1455	26216	11660	0	0	1239	0	605	0	0	0	81	75	206	85	807
BEV 200	2015	high	med	Midsize		1401	25943	11886	0	0	1345	0	0	0	0	0	88	0	210	85	807
BEV300 DM	2015	high	med	Midsize		1581	33070	18413	0	0	1341	0	605	0	0	0	88	75	325	85	807
BEV300	2015	high	med	Midsize		1534	33122	18935	0	0	1475	0	0	0	0	0	97	0	334	85	807
EREV PHEV30	2015	high	med	Midsize	CI	1637	22606	2776	0	2465	1086	996	1508	223	151	0	71	75	81	85	807
EREV PHEV30	2015	high	med	Midsize	CNG	1608	22324	2747	0	1053	1070	980	1508	1873	150	0	70	75	80	85	807
EREV PHEV30	2015	high	med	Midsize	E85	1548	20587	2688	0	1070	1036	947	1508	250	102	0	68	75	79	85	807
EREV PHEV30	2015	high	med	Midsize	SI	1545	20976	2686	0	1466	1032	946	1508	250	102	0	68	75	79	85	807

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
EREV PHEV40	2015	high	med	Midsize	CI	1668	22805	2925	0	2472	1103	1015	1508	223	151	0	73	75	108	85	807
EREV PHEV40	2015	high	med	Midsize	CNG	1639	22529	2897	0	1060	1091	999	1508	1880	151	0	72	75	106	85	807
EREV PHEV40	2015	high	med	Midsize	E85	1577	20765	2821	0	1077	1052	966	1508	250	103	0	69	75	104	85	807
EREV PHEV40	2015	high	med	Midsize	SI	1573	21152	2818	0	1473	1049	965	1508	250	103	0	69	75	104	85	807
FC Series HEV	2015	high	med	Midsize		1466	21829	1024	4089	0	1226	0	605	2376	0	111	81	75	11	85	807
FC Series PHEV10	2015	high	med	Midsize		1496	22518	1472	4118	0	1289	0	605	2336	0	115	85	75	35	85	807
FC Series PHEV20	2015	high	med	Midsize		1532	23525	2425	4153	0	1289	0	605	2356	0	118	85	75	67	85	807
FC Series PHEV30	2015	high	med	Midsize		1564	24427	3134	4186	0	1280	0	605	2510	0	120	84	75	92	85	807
FC Series PHEV40	2015	high	med	Midsize		1597	24658	3284	4217	0	1280	0	605	2560	0	122	84	75	121	85	807
Split PHEV10	2015	high	med	Midsize	CI	1568	20697	1618	0	2487	760	889	1160	223	153	0	50	75	38	85	807
Split PHEV10	2015	high	med	Midsize	CNG	1531	20291	1531	0	1081	837	609	1160	1982	153	0	55	75	36	85	807
Split PHEV10	2015	high	med	Midsize	E85	1466	18427	1487	0	1095	761	589	1160	250	105	0	50	75	35	85	807
Split PHEV10	2015	high	med	Midsize	SI	1463	18819	1486	0	1491	759	588	1160	250	105	0	50	75	35	85	807
Split PHEV20	2015	high	med	Midsize	CI	1606	21796	2682	0	2495	760	908	1160	223	153	0	50	75	74	85	807
Split PHEV20	2015	high	med	Midsize	CNG	1566	21305	2515	0	1089	837	623	1160	1985	153	0	55	75	70	85	807
Split PHEV20	2015	high	med	Midsize	E85	1502	19440	2474	0	1103	761	603	1160	250	106	0	50	75	69	85	807
Split PHEV20	2015	high	med	Midsize	SI	1499	19831	2473	0	1499	759	602	1160	250	106	0	50	75	69	85	807
Split HEV	2015	high	med	Midsize	CI	1532	19687	922	0	2473	698	853	1160	223	151	0	46	75	10	85	807
Split HEV	2015	high	med	Midsize	CNG	1505	19389	820	0	1075	894	600	1160	1941	152	0	59	75	9	85	807
Split HEV	2015	high	med	Midsize	E85	1436	17611	922	0	1082	741	567	1160	250	103	0	49	75	10	85	807
Split HEV	2015	high	med	Midsize	SI	1431	17892	820	0	1477	731	565	1160	250	103	0	48	75	9	85	807
Conventional	2015	low	med	Midsize	CI	1579	16393	52	0	2585	0	0	1648	223	162	0		75	0	85	933
Conventional	2015	low	med	Midsize	CNG	1603	17465	52	0	1215	0	0	1494	3346	165	0		75	0	85	933
Conventional	2015	low	med	Midsize	E85	1506	14338	52	0	1220	0	0	1466	250	122	0		75	0	85	933
Conventional	2015	low	med	Midsize	SI	1511	14400	52	0	1255	0	0	1471	250	130	0		75	0	85	933
BEV100 DM	2015	low	med	Midsize		1558	20347	6638	0	0	1221	0	605	0	0	0	87	75	177	85	933
BEV100	2015	low	med	Midsize		1507	20033	6770	0	0	1380	0	0	0	0	0	98	0	180	85	933
BEV 200 DM	2015	low	med	Midsize		1688	28132	14196	0	0	1449	0	605	0	0	0	103	75	291	85	933

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
BEV 200	2015	low	med	Midsize		1637	27895	14434	0	0	1578	0	0	0	0	0	112	0	296	85	933
BEV300 DM	2015	low	med	Midsize		1878	36986	22890	0	0	1608	0	605	0	0	0	115	75	469	85	933
BEV300	2015	low	med	Midsize		1835	37077	23430	0	0	1764	0	0	0	0	0	126	0	480	85	933
EREV PHEV30	2015	low	med	Midsize	CI	1855	23573	4091	0	2524	1284	1169	1508	223	156	0	91	75	130	85	933
EREV PHEV30	2015	low	med	Midsize	CNG	1858	23950	4093	0	1119	1285	1171	1508	2483	156	0	92	75	130	85	933
EREV PHEV30	2015	low	med	Midsize	E85	1766	21484	3974	0	1129	1222	1118	1508	250	110	0	87	75	126	85	933
EREV PHEV30	2015	low	med	Midsize	SI	1763	21431	3969	0	1100	1204	1116	1508	250	110	0	86	75	126	85	933
EREV PHEV40	2015	low	med	Midsize	CI	1908	23948	4331	0	2534	1367	1200	1508	223	157	0	97	75	173	85	933
EREV PHEV40	2015	low	med	Midsize	CNG	1912	24346	4335	0	1130	1370	1203	1508	2503	157	0	98	75	173	85	933
EREV PHEV40	2015	low	med	Midsize	E85	1816	21834	4206	0	1140	1292	1149	1508	250	111	0	92	75	168	85	933
EREV PHEV40	2015	low	med	Midsize	SI	1814	21797	4203	0	1111	1289	1148	1508	250	111	0	92	75	168	85	933
FC Series HEV	2015	low	med	Midsize		1662	21825	1078	4303	0	1341	0	605	2822	0	125	96	75	20	85	933
FC Series PHEV10	2015	low	med	Midsize		1711	23002	2009	4347	0	1417	0	605	2757	0	132	101	75	59	85	933
FC Series PHEV20	2015	low	med	Midsize		1773	24475	3388	4402	0	1417	0	605	2795	0	136	101	75	116	85	933
FC Series PHEV30	2015	low	med	Midsize		1806	25684	4373	4434	0	1397	0	605	2993	0	139	99	75	139	85	933
FC Series PHEV40	2015	low	med	Midsize		1862	26121	4688	4483	0	1397	0	605	3066	0	142	99	75	188	85	933
Split PHEV10	2015	low	med	Midsize	CI	1749	20771	2247	0	2533	839	1001	1160	223	157	0	60	75	66	85	933
Split PHEV10	2015	low	med	Midsize	CNG	1733	20813	2134	0	1141	928	709	1160	2454	158	0	66	75	63	85	933
Split PHEV10	2015	low	med	Midsize	E85	1642	18387	2047	0	1142	845	668	1160	250	111	0	60	75	60	85	933
Split PHEV10	2015	low	med	Midsize	SI	1640	18356	2047	0	1113	844	667	1160	250	111	0	60	75	60	85	933
Split PHEV20	2015	low	med	Midsize	CI	1817	22366	3787	0	2545	839	1033	1160	223	158	0	60	75	130	85	933
Split PHEV20	2015	low	med	Midsize	CNG	1796	22324	3587	0	1155	928	732	1160	2468	159	0	66	75	123	85	933
Split PHEV20	2015	low	med	Midsize	E85	1703	19821	3447	0	1153	845	687	1160	250	113	0	60	75	118	85	933
Split PHEV20	2015	low	med	Midsize	SI	1701	19790	3447	0	1124	844	686	1160	250	113	0	60	75	118	85	933
Split HEV	2015	low	med	Midsize	CI	1692	19124	934	0	2511	791	946	1160	223	155	0	56	75	19	85	933
Split HEV	2015	low	med	Midsize	CNG	1687	19380	934	0	1130	974	691	1160	2397	157	0	69	75	18	85	933
Split HEV	2015	low	med	Midsize	E85	1598	17056	934	0	1129	856	647	1160	250	110	0	61	75	18	85	933
Split HEV	2015	low	med	Midsize	SI	1594	16971	898	0	1100	838	646	1160	250	110	0	60	75	17	85	933

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Conventional	2015	med	med	Midsize	CI	1485	16917	52	0	2559	0	0	1618	223	159	0		75	0	85	842
Conventional	2015	med	med	Midsize	CNG	1502	17900	52	0	1192	0	0	1476	3230	163	0		75	0	85	842
Conventional	2015	med	med	Midsize	E85	1412	15165	52	0	1469	0	0	1451	250	119	0		75	0	85	842
Conventional	2015	med	med	Midsize	SI	1416	15205	52	0	1493	0	0	1449	250	126	0		75	0	85	842
BEV100 DM	2015	med	med	Midsize		1425	20271	6065	0	0	1121	0	605	0	0	0	77	75	145	85	842
BEV100	2015	med	med	Midsize		1371	19914	6169	0	0	1264	0	0	0	0	0	86	0	147	85	842
BEV 200 DM	2015	med	med	Midsize		1535	27308	12897	0	0	1325	0	605	0	0	0	91	75	241	85	842
BEV 200	2015	med	med	Midsize		1480	26981	13065	0	0	1435	0	0	0	0	0	98	0	244	85	842
BEV300 DM	2015	med	med	Midsize		1685	35070	20547	0	0	1438	0	605	0	0	0	98	75	384	85	842
BEV300	2015	med	med	Midsize		1637	35022	20963	0	0	1579	0	0	0	0	0	108	0	391	85	842
EREV PHEV30	2015	med	med	Midsize	CI	1711	23386	3595	0	2489	1162	1066	1508	223	153	0	79	75	102	85	842
EREV PHEV30	2015	med	med	Midsize	CNG	1697	23436	3579	0	1080	1158	1059	1508	2179	153	0	79	75	101	85	842
EREV PHEV30	2015	med	med	Midsize	E85	1621	21337	3492	0	1094	1111	1016	1508	250	105	0	76	75	99	85	842
EREV PHEV30	2015	med	med	Midsize	SI	1618	21298	3490	0	1065	1103	1015	1508	250	105	0	75	75	99	85	842
EREV PHEV40	2015	med	med	Midsize	CI	1748	23674	3826	0	2496	1183	1088	1508	223	153	0	81	75	136	85	842
EREV PHEV40	2015	med	med	Midsize	CNG	1735	23726	3806	0	1088	1172	1081	1508	2194	153	0	80	75	135	85	842
EREV PHEV40	2015	med	med	Midsize	E85	1658	21598	3702	0	1101	1128	1038	1508	250	106	0	77	75	132	85	842
EREV PHEV40	2015	med	med	Midsize	SI	1656	21564	3701	0	1073	1126	1037	1508	250	106	0	77	75	132	85	842
FC Series HEV	2015	med	med	Midsize		1530	21958	1024	4175	0	1264	0	605	2613	0	116	86	75	14	85	842
FC Series PHEV10	2015	med	med	Midsize		1569	23009	1833	4212	0	1326	0	605	2566	0	122	91	75	44	85	842
FC Series PHEV20	2015	med	med	Midsize		1616	24332	3087	4256	0	1326	0	605	2593	0	125	91	75	87	85	842
FC Series PHEV30	2015	med	med	Midsize		1652	25459	4001	4292	0	1314	0	605	2766	0	128	90	75	113	85	842
FC Series PHEV40	2015	med	med	Midsize		1694	25775	4221	4331	0	1314	0	605	2824	0	131	90	75	150	85	842
Split PHEV10	2015	med	med	Midsize	CI	1624	20981	2042	0	2503	784	927	1160	223	154	0	54	75	49	85	842
Split PHEV10	2015	med	med	Midsize	CNG	1599	20806	1934	0	1104	865	648	1160	2225	155	0	59	75	47	85	842
Split PHEV10	2015	med	med	Midsize	E85	1520	18645	1862	0	1111	786	616	1160	250	107	0	54	75	45	85	842
Split PHEV10	2015	med	med	Midsize	SI	1518	18616	1863	0	1082	785	615	1160	250	107	0	54	75	45	85	842
Split PHEV20	2015	med	med	Midsize	CI	1674	22378	3410	0	2510	784	944	1160	223	155	0	54	75	96	85	842

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Split PHEV20	2015	med	med	Midsize	CNG	1645	22136	3225	0	1115	865	665	1160	2232	156	0	59	75	91	85	842
Split PHEV20	2015	med	med	Midsize	E85	1565	19912	3110	0	1117	786	626	1160	250	108	0	54	75	88	85	842
Split PHEV20	2015	med	med	Midsize	SI	1563	19881	3110	0	1088	785	625	1160	250	108	0	54	75	88	85	842
Split HEV	2015	med	med	Midsize	CI	1580	19554	922	0	2485	745	883	1160	223	152	0	51	75	13	85	842
Split HEV	2015	med	med	Midsize	CNG	1561	19526	922	0	1095	875	633	1160	2164	154	0	60	75	12	85	842
Split HEV	2015	med	med	Midsize	E85	1484	17468	922	0	1099	776	596	1160	250	106	0	53	75	12	85	842
Split HEV	2015	med	med	Midsize	SI	1480	17428	922	0	1070	767	595	1160	250	105	0	52	75	12	85	842
Conventional	2020	high	med	Midsize	CI	1385	17475	52	0	2687	0	0	1502	212	156	0		75	0	85	746
Conventional	2020	high	med	Midsize	CNG	1380	18382	52	0	1999	0	0	1381	2405	160	0		75	0	85	746
Conventional	2020	high	med	Midsize	E85	1311	16189	52	0	2005	0	0	1357	238	115	0		75	0	85	746
Conventional	2020	high	med	Midsize	SI	1315	16259	52	0	2055	0	0	1359	238	122	0		75	0	85	746
BEV100 DM	2020	high	med	Midsize		1240	18293	4055	0	0	677	0	575	0	0	0	52	75	81	85	746
BEV100	2020	high	med	Midsize		1183	17892	4153	0	0	752	0	0	0	0	0	58	0	83	85	746
BEV 200 DM	2020	high	med	Midsize		1309	22837	8495	0	0	781	0	575	0	0	0	60	75	142	85	746
BEV 200	2020	high	med	Midsize		1249	22425	8609	0	0	829	0	0	0	0	0	64	0	143	85	746
BEV300 DM	2020	high	med	Midsize		1391	27595	13207	0	0	826	0	575	0	0	0	64	75	220	85	746
BEV300	2020	high	med	Midsize		1335	27332	13457	0	0	888	0	0	0	0	0	69	0	224	85	746
EREV PHEV30	2020	high	med	Midsize	CI	1518	21592	2232	0	2605	699	642	1434	212	149	0	54	75	57	85	746
EREV PHEV30	2020	high	med	Midsize	CNG	1475	21465	2176	0	1871	683	626	1434	1336	148	0	53	75	56	85	746
EREV PHEV30	2020	high	med	Midsize	E85	1429	20282	2112	0	1890	664	609	1434	238	99	0	51	75	56	85	746
EREV PHEV30	2020	high	med	Midsize	SI	1427	20274	2109	0	1888	662	609	1434	238	99	0	51	75	56	85	746
EREV PHEV40	2020	high	med	Midsize	CI	1538	21675	2292	0	2609	707	650	1434	212	149	0	55	75	76	85	746
EREV PHEV40	2020	high	med	Midsize	CNG	1495	21550	2235	0	1875	692	635	1434	1339	148	0	53	75	75	85	746
EREV PHEV40	2020	high	med	Midsize	E85	1448	20364	2173	0	1894	672	617	1434	238	99	0	52	75	73	85	746
EREV PHEV40	2020	high	med	Midsize	SI	1445	20352	2168	0	1892	667	617	1434	238	99	0	51	75	73	85	746
FC Series HEV	2020	high	med	Midsize		1355	19789	830	3181	0	802	0	575	1538	0	101	62	75	8	85	746
FC Series PHEV10	2020	high	med	Midsize		1373	20031	950	3194	0	833	0	575	1505	0	103	64	75	24	85	746
FC Series PHEV20	2020	high	med	Midsize		1398	20394	1285	3213	0	833	0	575	1514	0	105	64	75	46	85	746

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
FC Series PHEV30	2020	high	med	Midsize		1421	21149	1919	3233	0	830	0	575	1605	0	106	64	75	64	85	746
FC Series PHEV40	2020	high	med	Midsize		1446	21541	2271	3252	0	830	0	575	1628	0	108	64	75	85	85	746
Split PHEV10	2020	high	med	Midsize	CI	1466	19748	965	0	2625	496	574	1104	212	150	0	38	75	26	85	746
Split PHEV10	2020	high	med	Midsize	CNG	1420	19624	926	0	1897	545	391	1104	1424	150	0	42	75	25	85	746
Split PHEV10	2020	high	med	Midsize	E85	1369	18347	890	0	1912	494	379	1104	238	102	0	38	75	24	85	746
Split PHEV10	2020	high	med	Midsize	SI	1367	18344	891	0	1909	493	378	1104	238	102	0	38	75	24	85	746
Split PHEV20	2020	high	med	Midsize	CI	1493	20234	1423	0	2633	496	588	1104	212	151	0	38	75	51	85	746
Split PHEV20	2020	high	med	Midsize	CNG	1444	20033	1326	0	1900	545	395	1104	1425	151	0	42	75	47	85	746
Split PHEV20	2020	high	med	Midsize	E85	1394	18794	1316	0	1920	494	389	1104	238	103	0	38	75	47	85	746
Split PHEV20	2020	high	med	Midsize	SI	1392	18791	1315	0	1918	493	388	1104	238	103	0	38	75	47	85	746
Split HEV	2020	high	med	Midsize	CI	1443	19334	738	0	2614	460	554	1104	212	149	0	36	75	7	85	746
Split HEV	2020	high	med	Midsize	CNG	1401	19277	738	0	1891	534	383	1104	1404	150	0	41	75	7	85	746
Split HEV	2020	high	med	Midsize	E85	1348	18030	738	0	1899	472	363	1104	238	100	0	36	75	8	85	746
Split HEV	2020	high	med	Midsize	SI	1346	18026	738	0	1897	471	363	1104	238	100	0	36	75	8	85	746
Conventional	2020	low	med	Midsize	CI	1560	16217	52	0	2452	0	0	1565	212	161	0		75	0	85	916
Conventional	2020	low	med	Midsize	CNG	1578	16897	52	0	1150	0	0	1421	2837	164	0		75	0	85	916
Conventional	2020	low	med	Midsize	E85	1487	14282	52	0	1160	0	0	1400	238	122	0		75	0	85	916
Conventional	2020	low	med	Midsize	SI	1493	14329	52	0	1188	0	0	1400	238	130	0		75	0	85	916
BEV100 DM	2020	low	med	Midsize		1501	18380	5120	0	0	817	0	575	0	0	0	67	75	157	85	916
BEV100	2020	low	med	Midsize		1447	18003	5214	0	0	921	0	0	0	0	0	76	0	159	85	916
BEV 200 DM	2020	low	med	Midsize		1612	24270	10864	0	0	963	0	575	0	0	0	79	75	256	85	916
BEV 200	2020	low	med	Midsize		1557	23911	10999	0	0	1044	0	0	0	0	0	86	0	259	85	916
BEV300 DM	2020	low	med	Midsize		1772	30843	17347	0	0	1053	0	575	0	0	0	87	75	408	85	916
BEV300	2020	low	med	Midsize		1723	30705	17686	0	0	1151	0	0	0	0	0	95	0	416	85	916
EREV PHEV30	2020	low	med	Midsize	CI	1768	21148	2795	0	2384	844	776	1434	212	154	0	70	75	102	85	916
EREV PHEV30	2020	low	med	Midsize	CNG	1760	21121	2785	0	1045	846	772	1434	1990	154	0	70	75	101	85	916
EREV PHEV30	2020	low	med	Midsize	E85	1680	19189	2665	0	1058	811	741	1434	238	107	0	67	75	99	85	916
EREV PHEV30	2020	low	med	Midsize	SI	1676	19150	2659	0	1030	807	739	1434	238	107	0	66	75	99	85	916

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
EREV PHEV40	2020	low	med	Midsize	CI	1804	21512	3111	0	2391	864	791	1434	212	155	0	71	75	135	85	916
EREV PHEV40	2020	low	med	Midsize	CNG	1797	21500	3106	0	1053	859	788	1434	2007	155	0	71	75	135	85	916
EREV PHEV40	2020	low	med	Midsize	E85	1715	19584	3022	0	1065	823	756	1434	238	108	0	68	75	131	85	916
EREV PHEV40	2020	low	med	Midsize	SI	1712	19551	3018	0	1038	823	755	1434	238	108	0	68	75	131	85	916
FC Series HEV	2020	low	med	Midsize		1604	19578	1014	3393	0	911	0	575	1941	0	122	75	75	14	85	916
FC Series PHEV10	2020	low	med	Midsize		1635	19853	1161	3414	0	948	0	575	1901	0	127	78	75	40	85	916
FC Series PHEV20	2020	low	med	Midsize		1678	20607	1869	3444	0	948	0	575	1917	0	130	78	75	79	85	916
FC Series PHEV30	2020	low	med	Midsize		1719	21418	2506	3475	0	942	0	575	2052	0	133	78	75	109	85	916
FC Series PHEV40	2020	low	med	Midsize		1759	22309	3332	3502	0	942	0	575	2090	0	136	78	75	144	85	916
Split PHEV10	2020	low	med	Midsize	CI	1679	18925	1294	0	2393	562	664	1104	212	155	0	46	75	45	85	916
Split PHEV10	2020	low	med	Midsize	CNG	1657	18677	1230	0	1065	620	467	1104	1946	156	0	51	75	43	85	916
Split PHEV10	2020	low	med	Midsize	E85	1578	16838	1187	0	1069	565	442	1104	238	109	0	46	75	41	85	916
Split PHEV10	2020	low	med	Midsize	SI	1575	16807	1186	0	1041	564	441	1104	238	109	0	46	75	41	85	916
Split PHEV20	2020	low	med	Midsize	CI	1724	19724	2068	0	2399	562	676	1104	212	156	0	46	75	88	85	916
Split PHEV20	2020	low	med	Midsize	CNG	1699	19436	1963	0	1074	620	477	1104	1950	157	0	51	75	83	85	916
Split PHEV20	2020	low	med	Midsize	E85	1620	17564	1895	0	1076	565	450	1104	238	110	0	46	75	81	85	916
Split PHEV20	2020	low	med	Midsize	SI	1617	17533	1894	0	1048	564	450	1104	238	110	0	46	75	81	85	916
Split HEV	2020	low	med	Midsize	CI	1640	18274	830	0	2378	538	638	1104	212	154	0	44	75	12	85	916
Split HEV	2020	low	med	Midsize	CNG	1624	18121	830	0	1058	641	458	1104	1899	155	0	53	75	11	85	916
Split HEV	2020	low	med	Midsize	E85	1547	16344	830	0	1061	560	432	1104	238	108	0	46	75	11	85	916
Split HEV	2020	low	med	Midsize	SI	1542	16302	830	0	1032	547	431	1104	238	108	0	45	75	11	85	916
Conventional	2020	med	med	Midsize	CI	1434	17073	52	0	2418	0	0	1671	212	158	0		75	0	85	793
Conventional	2020	med	med	Midsize	CNG	1440	17580	52	0	1110	0	0	1536	2647	160	0		75	0	85	793
Conventional	2020	med	med	Midsize	E85	1359	15528	52	0	1497	0	0	1514	238	116	0		75	0	85	793
Conventional	2020	med	med	Midsize	SI	1363	15567	52	0	1519	0	0	1514	238	123	0		75	0	85	793
BEV100 DM	2020	med	med	Midsize		1325	18492	4512	0	0	729	0	575	0	0	0	58	75	113	85	793
BEV100	2020	med	med	Midsize		1269	18075	4586	0	0	813	0	0	0	0	0	65	0	115	85	793
BEV 200 DM	2020	med	med	Midsize		1411	23617	9519	0	0	847	0	575	0	0	0	67	75	190	85	793

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
BEV 200	2020	med	med	Midsize		1354	23179	9589	0	0	913	0	0	0	0	0	73	0	192	85	793
BEV300 DM	2020	med	med	Midsize		1527	29147	14984	0	0	911	0	575	0	0	0	73	75	300	85	793
BEV300	2020	med	med	Midsize		1472	28847	15185	0	0	986	0	0	0	0	0	79	0	304	85	793
EREV PHEV30	2020	med	med	Midsize	CI	1595	21346	2433	0	2345	753	691	1434	212	151	0	60	75	74	85	793
EREV PHEV30	2020	med	med	Midsize	CNG	1562	20802	2387	0	1002	741	679	1434	1521	150	0	59	75	73	85	793
EREV PHEV30	2020	med	med	Midsize	E85	1506	19412	2311	0	1019	718	658	1434	238	102	0	57	75	72	85	793
EREV PHEV30	2020	med	med	Midsize	SI	1504	19379	2309	0	991	716	657	1434	238	102	0	57	75	72	85	793
EREV PHEV40	2020	med	med	Midsize	CI	1623	21654	2710	0	2350	765	701	1434	212	151	0	61	75	100	85	793
EREV PHEV40	2020	med	med	Midsize	CNG	1591	21100	2646	0	1007	754	690	1434	1528	151	0	60	75	98	85	793
EREV PHEV40	2020	med	med	Midsize	E85	1533	19745	2618	0	1023	729	667	1434	238	102	0	58	75	97	85	793
EREV PHEV40	2020	med	med	Midsize	SI	1531	19711	2615	0	996	727	666	1434	238	102	0	58	75	97	85	793
FC Series HEV	2020	med	med	Midsize		1437	19855	922	3263	0	837	0	575	1704	0	109	67	75	11	85	793
FC Series PHEV10	2020	med	med	Midsize		1458	20079	1031	3279	0	869	0	575	1663	0	112	69	75	30	85	793
FC Series PHEV20	2020	med	med	Midsize		1490	20727	1643	3302	0	869	0	575	1675	0	114	69	75	59	85	793
FC Series PHEV30	2020	med	med	Midsize		1520	21413	2187	3327	0	864	0	575	1784	0	116	69	75	81	85	793
FC Series PHEV40	2020	med	med	Midsize		1554	22249	2969	3352	0	864	0	575	1812	0	119	69	75	110	85	793
Split PHEV10	2020	med	med	Midsize	CI	1529	19414	1143	0	2359	516	604	1104	212	152	0	41	75	33	85	793
Split PHEV10	2020	med	med	Midsize	CNG	1493	18855	1079	0	1024	568	417	1104	1629	152	0	45	75	32	85	793
Split PHEV10	2020	med	med	Midsize	E85	1431	17365	1046	0	1035	515	400	1104	238	104	0	41	75	31	85	793
Split PHEV10	2020	med	med	Midsize	SI	1429	17337	1047	0	1007	514	399	1104	238	104	0	41	75	31	85	793
Split PHEV20	2020	med	med	Midsize	CI	1561	20094	1816	0	2361	516	607	1104	212	152	0	41	75	65	85	793
Split PHEV20	2020	med	med	Midsize	CNG	1524	19505	1712	0	1030	568	424	1104	1629	153	0	45	75	61	85	793
Split PHEV20	2020	med	med	Midsize	E85	1459	17984	1659	0	1037	515	403	1104	238	104	0	41	75	59	85	793
Split PHEV20	2020	med	med	Midsize	SI	1457	17955	1659	0	1009	514	402	1104	238	104	0	41	75	59	85	793
Split HEV	2020	med	med	Midsize	CI	1502	18925	830	0	2350	486	586	1104	212	151	0	39	75	10	85	793
Split HEV	2020	med	med	Midsize	CNG	1470	18366	738	0	1019	575	411	1104	1597	152	0	46	75	9	85	793
Split HEV	2020	med	med	Midsize	E85	1407	16919	738	0	1026	509	390	1104	238	103	0	41	75	9	85	793
Split HEV	2020	med	med	Midsize	SI	1402	16863	738	0	995	493	384	1104	238	102	0	39	75	9	85	793

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Conventional	2025	high	med	Midsize	CI	1323	17901	52	0	2811	0	0	1480	201	155	0		75	0	85	685
Conventional	2025	high	med	Midsize	CNG	1312	18526	52	0	2037	0	0	1363	2165	158	0		75	0	85	685
Conventional	2025	high	med	Midsize	E85	1247	16572	52	0	2046	0	0	1343	226	112	0		75	0	85	685
Conventional	2025	high	med	Midsize	SI	1251	16639	52	0	2093	0	0	1346	226	119	0		75	0	85	685
BEV100 DM	2025	high	med	Midsize		1146	17094	2662	0	0	556	0	547	0	0	0	43	75	57	85	685
BEV100	2025	high	med	Midsize		1087	16662	2717	0	0	616	0	0	0	0	0	48	0	58	85	685
BEV 200 DM	2025	high	med	Midsize		1195	20052	5537	0	0	639	0	547	0	0	0	50	75	99	85	685
BEV 200	2025	high	med	Midsize		1133	19581	5581	0	0	671	0	0	0	0	0	52	0	100	85	685
BEV300 DM	2025	high	med	Midsize		1251	23064	8523	0	0	666	0	547	0	0	0	52	75	153	85	685
BEV300	2025	high	med	Midsize		1191	22666	8628	0	0	709	0	0	0	0	0	55	0	155	85	685
EREV PHEV30	2025	high	med	Midsize	CI	1426	21431	1963	0	2732	583	533	1363	201	147	0	46	75	44	85	685
EREV PHEV30	2025	high	med	Midsize	CNG	1376	21033	1899	0	1918	567	517	1363	1114	146	0	44	75	43	85	685
EREV PHEV30	2025	high	med	Midsize	E85	1335	20096	1863	0	1937	551	504	1363	226	96	0	43	75	42	85	685
EREV PHEV30	2025	high	med	Midsize	SI	1333	20065	1860	0	1911	550	503	1363	226	96	0	43	75	42	85	685
EREV PHEV40	2025	high	med	Midsize	CI	1441	21492	2006	0	2735	589	539	1363	201	147	0	46	75	59	85	685
EREV PHEV40	2025	high	med	Midsize	CNG	1392	21098	1944	0	1921	573	523	1363	1118	146	0	45	75	57	85	685
EREV PHEV40	2025	high	med	Midsize	E85	1351	20141	1892	0	1940	557	510	1363	226	96	0	43	75	57	85	685
EREV PHEV40	2025	high	med	Midsize	SI	1349	20110	1890	0	1914	555	509	1363	226	96	0	43	75	57	85	685
FC Series HEV	2025	high	med	Midsize		1257	19000	710	2545	0	667	0	547	1310	0	90	52	75	7	85	685
FC Series PHEV10	2025	high	med	Midsize		1270	19234	842	2553	0	691	0	547	1282	0	91	54	75	18	85	685
FC Series PHEV20	2025	high	med	Midsize		1289	19353	944	2566	0	691	0	547	1288	0	92	54	75	36	85	685
FC Series PHEV30	2025	high	med	Midsize		1306	20164	1658	2580	0	688	0	547	1363	0	93	54	75	48	85	685
FC Series PHEV40	2025	high	med	Midsize		1323	20220	1688	2591	0	688	0	547	1378	0	94	54	75	64	85	685
Split PHEV10	2025	high	med	Midsize	CI	1387	19824	862	0	2751	420	478	1049	201	149	0	33	75	21	85	685
Split PHEV10	2025	high	med	Midsize	CNG	1334	19438	822	0	1942	459	324	1049	1187	148	0	36	75	19	85	685
Split PHEV10	2025	high	med	Midsize	E85	1291	18405	792	0	1956	417	314	1049	226	99	0	33	75	19	85	685
Split PHEV10	2025	high	med	Midsize	SI	1288	18377	792	0	1930	416	314	1049	226	99	0	33	75	19	85	685
Split PHEV20	2025	high	med	Midsize	CI	1407	20030	1056	0	2754	420	484	1049	201	149	0	33	75	40	85	685

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Split PHEV20	2025	high	med	Midsize	CNG	1352	19593	979	0	1942	459	324	1049	1185	148	0	36	75	37	85	685
Split PHEV20	2025	high	med	Midsize	E85	1308	18569	956	0	1956	417	314	1049	226	99	0	33	75	36	85	685
Split PHEV20	2025	high	med	Midsize	SI	1305	18541	956	0	1930	416	314	1049	226	99	0	33	75	36	85	685
Split HEV	2025	high	med	Midsize	CI	1368	19506	710	0	2741	388	461	1049	201	148	0	30	75	7	85	685
Split HEV	2025	high	med	Midsize	CNG	1322	19136	621	0	1936	485	317	1049	1172	148	0	38	75	6	85	685
Split HEV	2025	high	med	Midsize	E85	1274	18182	710	0	1946	400	302	1049	226	97	0	31	75	7	85	685
Split HEV	2025	high	med	Midsize	SI	1271	18065	621	0	1921	396	303	1049	226	97	0	31	75	6	85	685
Conventional	2025	low	med	Midsize	CI	1543	16062	52	0	2327	0	0	1489	201	161	0		75	0	85	899
Conventional	2025	low	med	Midsize	CNG	1558	17123	52	0	1579	0	0	1354	2618	164	0		75	0	85	899
Conventional	2025	low	med	Midsize	E85	1469	14955	52	0	1831	0	0	1331	226	121	0		75	0	85	899
Conventional	2025	low	med	Midsize	SI	1474	15006	52	0	1861	0	0	1334	226	129	0		75	0	85	899
BEV100 DM	2025	low	med	Midsize		1427	16627	3463	0	0	695	0	547	0	0	0	58	75	109	85	899
BEV100	2025	low	med	Midsize		1371	16227	3526	0	0	779	0	0	0	0	0	65	0	111	85	899
BEV 200 DM	2025	low	med	Midsize		1503	20540	7273	0	0	798	0	547	0	0	0	67	75	176	85	899
BEV 200	2025	low	med	Midsize		1444	20127	7341	0	0	864	0	0	0	0	0	72	0	177	85	899
BEV300 DM	2025	low	med	Midsize		1606	24694	11375	0	0	850	0	547	0	0	0	71	75	275	85	899
BEV300	2025	low	med	Midsize		1550	24358	11513	0	0	924	0	0	0	0	0	77	0	278	85	899
EREV PHEV30	2025	low	med	Midsize	CI	1716	20465	2541	0	2256	729	667	1363	201	153	0	61	75	85	85	899
EREV PHEV30	2025	low	med	Midsize	CNG	1700	20746	2517	0	1472	726	661	1363	1727	153	0	61	75	85	85	899
EREV PHEV30	2025	low	med	Midsize	E85	1628	19097	2416	0	1485	696	636	1363	226	106	0	58	75	83	85	899
EREV PHEV30	2025	low	med	Midsize	SI	1626	19065	2413	0	1459	694	635	1363	226	106	0	58	75	83	85	899
EREV PHEV40	2025	low	med	Midsize	CI	1748	20588	2629	0	2262	741	679	1363	201	154	0	62	75	114	85	899
EREV PHEV40	2025	low	med	Midsize	CNG	1732	20881	2608	0	1478	739	673	1363	1737	154	0	62	75	113	85	899
EREV PHEV40	2025	low	med	Midsize	E85	1658	19211	2496	0	1491	710	648	1363	226	107	0	59	75	110	85	899
EREV PHEV40	2025	low	med	Midsize	SI	1655	19175	2491	0	1465	707	646	1363	226	106	0	59	75	110	85	899
FC Series HEV	2025	low	med	Midsize		1558	18551	888	2765	0	791	0	547	1746	0	118	66	75	12	85	899
FC Series PHEV10	2025	low	med	Midsize		1584	18827	1063	2780	0	820	0	547	1707	0	123	68	75	34	85	899
FC Series PHEV20	2025	low	med	Midsize		1619	19283	1484	2801	0	820	0	547	1721	0	125	68	75	66	85	899

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
FC Series PHEV30	2025	low	med	Midsize		1653	20083	2140	2823	0	816	0	547	1836	0	127	68	75	91	85	899
FC Series PHEV40	2025	low	med	Midsize		1690	20526	2531	2844	0	816	0	547	1867	0	130	68	75	123	85	899
Split PHEV10	2025	low	med	Midsize	CI	1642	18340	1057	0	2265	492	573	1049	201	154	0	41	75	38	85	899
Split PHEV10	2025	low	med	Midsize	CNG	1612	18429	1027	0	1489	542	399	1049	1649	155	0	45	75	36	85	899
Split PHEV10	2025	low	med	Midsize	E85	1542	16891	981	0	1495	493	380	1049	226	107	0	41	75	34	85	899
Split PHEV10	2025	low	med	Midsize	SI	1540	16863	981	0	1469	492	379	1049	226	107	0	41	75	34	85	899
Split PHEV20	2025	low	med	Midsize	CI	1678	18944	1647	0	2269	492	580	1049	201	155	0	41	75	73	85	899
Split PHEV20	2025	low	med	Midsize	CNG	1646	18986	1561	0	1496	542	406	1049	1654	155	0	45	75	69	85	899
Split PHEV20	2025	low	med	Midsize	E85	1576	17433	1511	0	1500	493	385	1049	226	108	0	41	75	67	85	899
Split PHEV20	2025	low	med	Midsize	SI	1574	17406	1511	0	1474	492	385	1049	226	108	0	41	75	67	85	899
Split HEV	2025	low	med	Midsize	CI	1609	17929	799	0	2256	468	558	1049	201	153	0	39	75	10	85	899
Split HEV	2025	low	med	Midsize	CNG	1585	18076	799	0	1483	554	392	1049	1623	154	0	46	75	10	85	899
Split HEV	2025	low	med	Midsize	E85	1515	16582	799	0	1488	481	372	1049	226	106	0	40	75	10	85	899
Split HEV	2025	low	med	Midsize	SI	1511	16534	799	0	1457	473	366	1049	226	105	0	39	75	11	85	899
Conventional	2025	med	med	Midsize	CI	1378	17398	52	0	2553	0	0	1577	201	156	0		75	0	85	739
Conventional	2025	med	med	Midsize	CNG	1380	18120	52	0	1648	0	0	1456	2404	159	0		75	0	85	739
Conventional	2025	med	med	Midsize	E85	1302	16168	52	0	1900	0	0	1435	226	114	0		75	0	85	739
Conventional	2025	med	med	Midsize	SI	1306	16228	52	0	1944	0	0	1435	226	121	0		75	0	85	739
BEV100 DM	2025	med	med	Midsize		1225	17102	2978	0	0	601	0	547	0	0	0	48	75	77	85	739
BEV100	2025	med	med	Midsize		1167	16665	3021	0	0	667	0	0	0	0	0	54	0	78	85	739
BEV 200 DM	2025	med	med	Midsize		1284	20440	6227	0	0	690	0	547	0	0	0	56	75	128	85	739
BEV 200	2025	med	med	Midsize		1223	19954	6248	0	0	730	0	0	0	0	0	59	0	129	85	739
BEV300 DM	2025	med	med	Midsize		1358	23905	9654	0	0	727	0	547	0	0	0	59	75	199	85	739
BEV300	2025	med	med	Midsize		1298	23465	9710	0	0	779	0	0	0	0	0	63	0	200	85	739
EREV PHEV30	2025	med	med	Midsize	CI	1508	21134	2154	0	2481	633	578	1363	201	149	0	51	75	60	85	739
EREV PHEV30	2025	med	med	Midsize	CNG	1469	20805	2102	0	1539	620	565	1363	1303	148	0	50	75	59	85	739
EREV PHEV30	2025	med	med	Midsize	E85	1417	19640	2037	0	1556	601	548	1363	226	99	0	48	75	58	85	739
EREV PHEV30	2025	med	med	Midsize	SI	1415	19609	2035	0	1530	599	547	1363	226	99	0	48	75	58	85	739

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
EREV PHEV40	2025	med	med	Midsize	CI	1529	21202	2201	0	2484	642	585	1363	201	149	0	52	75	80	85	739
EREV PHEV40	2025	med	med	Midsize	CNG	1491	20894	2152	0	1542	644	572	1363	1307	149	0	52	75	78	85	739
EREV PHEV40	2025	med	med	Midsize	E85	1438	19708	2087	0	1559	608	554	1363	226	100	0	49	75	76	85	739
EREV PHEV40	2025	med	med	Midsize	SI	1435	19675	2083	0	1533	606	553	1363	226	99	0	49	75	76	85	739
FC Series HEV	2025	med	med	Midsize		1351	19036	799	2626	0	707	0	547	1489	0	103	57	75	9	85	739
FC Series PHEV10	2025	med	med	Midsize		1370	19251	913	2638	0	734	0	547	1454	0	106	59	75	25	85	739
FC Series PHEV20	2025	med	med	Midsize		1396	19547	1183	2655	0	734	0	547	1463	0	108	59	75	49	85	739
FC Series PHEV30	2025	med	med	Midsize		1418	20298	1820	2671	0	729	0	547	1554	0	109	59	75	65	85	739
FC Series PHEV40	2025	med	med	Midsize		1444	20528	2012	2687	0	729	0	547	1577	0	111	59	75	87	85	739
Split PHEV10	2025	med	med	Midsize	CI	1456	19347	925	0	2496	441	509	1049	201	150	0	36	75	28	85	739
Split PHEV10	2025	med	med	Midsize	CNG	1411	18989	888	0	1558	484	347	1049	1353	150	0	39	75	26	85	739
Split PHEV10	2025	med	med	Midsize	E85	1356	17777	851	0	1572	439	335	1049	226	101	0	35	75	25	85	739
Split PHEV10	2025	med	med	Midsize	SI	1354	17750	852	0	1546	438	335	1049	226	101	0	35	75	25	85	739
Split PHEV20	2025	med	med	Midsize	CI	1483	19750	1296	0	2505	441	524	1049	201	151	0	36	75	53	85	739
Split PHEV20	2025	med	med	Midsize	CNG	1439	19370	1233	0	1572	484	362	1049	1352	152	0	39	75	51	85	739
Split PHEV20	2025	med	med	Midsize	E85	1383	18144	1195	0	1581	439	346	1049	226	103	0	35	75	49	85	739
Split PHEV20	2025	med	med	Midsize	SI	1381	18116	1194	0	1554	438	345	1049	226	103	0	35	75	49	85	739
Split HEV	2025	med	med	Midsize	CI	1432	18973	710	0	2485	416	492	1049	201	149	0	34	75	8	85	739
Split HEV	2025	med	med	Midsize	CNG	1389	18654	710	0	1553	472	340	1049	1318	150	0	38	75	8	85	739
Split HEV	2025	med	med	Midsize	E85	1336	17492	710	0	1560	420	322	1049	226	100	0	34	75	8	85	739
Split HEV	2025	med	med	Midsize	SI	1334	17464	710	0	1534	420	322	1049	226	100	0	34	75	8	85	739
Conventional	2030	high	med	Midsize	CI	1253	18094	0	0	2653	35	0	1455	191	153	0	3	75	0	85	617
Conventional	2030	high	med	Midsize	CNG	1228	17837	0	0	1917	35	0	1346	1197	156	0	3	75	0	85	617
Conventional	2030	high	med	Midsize	E85	1176	16841	0	0	1926	35	0	1327	215	109	0	3	75	0	85	617
Conventional	2030	high	med	Midsize	SI	1179	16896	0	0	1966	35	0	1329	215	115	0	3	75	0	85	617
BEV100 DM	2030	high	med	Midsize		1064	16840	2137	0	0	450	0	520	0	0	0	36	75	50	85	617
BEV100	2030	high	med	Midsize		1003	16385	2155	0	0	497	0	0	0	0	0	39	0	51	85	617
BEV 200 DM	2030	high	med	Midsize		1104	19135	4370	0	0	512	0	520	0	0	0	41	75	85	85	617

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
BEV 200	2030	high	med	Midsize		1042	18679	4408	0	0	539	0	0	0	0	0	43	0	86	85	617
BEV300 DM	2030	high	med	Midsize		1151	21495	6709	0	0	532	0	520	0	0	0	42	75	131	85	617
BEV300	2030	high	med	Midsize		1091	21090	6789	0	0	568	0	0	0	0	0	45	0	133	85	617
EREV PHEV30	2030	high	med	Midsize	CI	1329	21082	1704	0	2579	474	430	1297	191	145	0	38	75	33	85	617
EREV PHEV30	2030	high	med	Midsize	CNG	1270	20201	1631	0	1802	461	413	1297	564	144	0	37	75	32	85	617
EREV PHEV30	2030	high	med	Midsize	E85	1239	19810	1595	0	1822	446	404	1297	215	93	0	35	75	32	85	617
EREV PHEV30	2030	high	med	Midsize	SI	1237	19804	1592	0	1820	445	404	1297	215	93	0	35	75	32	85	617
EREV PHEV40	2030	high	med	Midsize	CI	1340	21125	1735	0	2581	477	434	1297	191	145	0	38	75	44	85	617
EREV PHEV40	2030	high	med	Midsize	CNG	1280	20241	1664	0	1804	459	417	1297	566	144	0	36	75	43	85	617
EREV PHEV40	2030	high	med	Midsize	E85	1250	19851	1626	0	1824	449	408	1297	215	93	0	36	75	42	85	617
EREV PHEV40	2030	high	med	Midsize	SI	1248	19845	1624	0	1822	448	407	1297	215	93	0	36	75	42	85	617
FC Series HEV	2030	high	med	Midsize		1153	18352	683	2030	0	538	0	520	952	0	79	43	75	6	85	617
FC Series PHEV10	2030	high	med	Midsize		1161	18502	734	2035	0	558	0	520	934	0	79	44	75	14	85	617
FC Series PHEV20	2030	high	med	Midsize		1175	18535	754	2043	0	558	0	520	938	0	80	44	75	27	85	617
FC Series PHEV30	2030	high	med	Midsize		1189	19269	1411	2053	0	554	0	520	998	0	81	44	75	37	85	617
FC Series PHEV40	2030	high	med	Midsize		1201	19305	1433	2060	0	554	0	520	1005	0	82	44	75	48	85	617
Split PHEV10	2030	high	med	Midsize	CI	1301	19693	757	0	2597	347	389	998	191	147	0	28	75	16	85	617
Split PHEV10	2030	high	med	Midsize	CNG	1238	18809	715	0	1825	378	261	998	599	146	0	30	75	15	85	617
Split PHEV10	2030	high	med	Midsize	E85	1205	18371	693	0	1840	343	253	998	215	96	0	27	75	15	85	617
Split PHEV10	2030	high	med	Midsize	SI	1202	18368	693	0	1838	342	253	998	215	95	0	27	75	15	85	617
Split PHEV20	2030	high	med	Midsize	CI	1315	19781	837	0	2592	374	380	998	191	146	0	30	75	30	85	617
Split PHEV20	2030	high	med	Midsize	CNG	1251	18887	793	0	1825	378	261	998	598	146	0	30	75	28	85	617
Split PHEV20	2030	high	med	Midsize	E85	1219	18460	771	0	1836	363	249	998	215	95	0	29	75	28	85	617
Split PHEV20	2030	high	med	Midsize	SI	1217	18455	771	0	1834	361	249	998	215	95	0	29	75	28	85	617
Split HEV	2030	high	med	Midsize	CI	1285	19380	598	0	2587	323	373	998	191	145	0	26	75	5	85	617
Split HEV	2030	high	med	Midsize	CNG	1225	18553	598	0	1817	363	252	998	589	145	0	29	75	5	85	617
Split HEV	2030	high	med	Midsize	E85	1192	18148	598	0	1832	329	244	998	215	94	0	26	75	6	85	617
Split HEV	2030	high	med	Midsize	SI	1190	18145	598	0	1830	329	244	998	215	94	0	26	75	6	85	617

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Conventional	2030	low	med	Midsize	CI	1489	16242	52	0	2198	0	0	1534	191	159	0		75	0	85	848
Conventional	2030	low	med	Midsize	CNG	1497	16720	52	0	1975	0	0	1408	1461	162	0		75	0	85	848
Conventional	2030	low	med	Midsize	E85	1415	15312	52	0	1835	0	0	1391	215	118	0		75	0	85	848
Conventional	2030	low	med	Midsize	SI	1419	15339	52	0	1852	0	0	1387	215	125	0		75	0	85	848
BEV100 DM	2030	low	med	Midsize		1354	16190	2879	0	0	577	0	520	0	0	0	48	75	97	85	848
BEV100	2030	low	med	Midsize		1297	15789	2929	0	0	645	0	0	0	0	0	54	0	99	85	848
BEV 200 DM	2030	low	med	Midsize		1422	19415	6018	0	0	662	0	520	0	0	0	56	75	157	85	848
BEV 200	2030	low	med	Midsize		1362	18986	6057	0	0	714	0	0	0	0	0	60	0	158	85	848
BEV300 DM	2030	low	med	Midsize		1512	22811	9374	0	0	703	0	520	0	0	0	59	75	244	85	848
BEV300	2030	low	med	Midsize		1455	22455	9480	0	0	760	0	0	0	0	0	64	0	247	85	848
EREV PHEV30	2030	low	med	Midsize	CI	1630	19977	2253	0	2129	607	553	1297	191	152	0	51	75	71	85	848
EREV PHEV30	2030	low	med	Midsize	CNG	1604	19999	2217	0	1875	600	545	1297	920	151	0	50	75	70	85	848
EREV PHEV30	2030	low	med	Midsize	E85	1542	19184	2137	0	1889	579	526	1297	215	103	0	49	75	69	85	848
EREV PHEV30	2030	low	med	Midsize	SI	1539	19155	2135	0	1864	577	525	1297	215	103	0	48	75	69	85	848
EREV PHEV40	2030	low	med	Midsize	CI	1656	20070	2321	0	2134	615	561	1297	191	152	0	52	75	95	85	848
EREV PHEV40	2030	low	med	Midsize	CNG	1631	20098	2288	0	1879	609	554	1297	924	152	0	51	75	94	85	848
EREV PHEV40	2030	low	med	Midsize	E85	1567	19262	2192	0	1893	587	534	1297	215	104	0	49	75	92	85	848
EREV PHEV40	2030	low	med	Midsize	SI	1565	19232	2188	0	1868	586	534	1297	215	104	0	49	75	92	85	848
FC Series HEV	2030	low	med	Midsize		1482	17740	854	2242	0	663	0	520	1351	0	113	56	75	11	85	848
FC Series PHEV10	2030	low	med	Midsize		1499	17937	961	2251	0	683	0	520	1319	0	116	57	75	26	85	848
FC Series PHEV20	2030	low	med	Midsize		1526	18291	1294	2264	0	683	0	520	1326	0	118	57	75	51	85	848
FC Series PHEV30	2030	low	med	Midsize		1559	18980	1862	2283	0	682	0	520	1418	0	120	57	75	76	85	848
FC Series PHEV40	2030	low	med	Midsize		1589	19443	2291	2297	0	682	0	520	1438	0	122	57	75	102	85	848
Split PHEV10	2030	low	med	Midsize	CI	1566	18106	949	0	2137	413	475	998	191	152	0	35	75	29	85	848
Split PHEV10	2030	low	med	Midsize	CNG	1528	17984	916	0	1888	454	327	998	859	153	0	38	75	28	85	848
Split PHEV10	2030	low	med	Midsize	E85	1470	17251	879	0	1898	413	314	998	215	105	0	35	75	27	85	848
Split PHEV10	2030	low	med	Midsize	SI	1467	17225	879	0	1873	412	314	998	215	104	0	35	75	27	85	848
Split PHEV20	2030	low	med	Midsize	CI	1594	18604	1442	0	2139	413	477	998	191	153	0	35	75	56	85	848

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Split PHEV20	2030	low	med	Midsize	CNG	1554	18442	1364	0	1893	454	332	998	858	153	0	38	75	53	85	848
Split PHEV20	2030	low	med	Midsize	E85	1496	17704	1326	0	1900	413	317	998	215	105	0	35	75	52	85	848
Split PHEV20	2030	low	med	Midsize	SI	1494	17678	1325	0	1876	412	316	998	215	105	0	35	75	52	85	848
Split HEV	2030	low	med	Midsize	CI	1544	17786	768	0	2130	392	463	998	191	152	0	33	75	10	85	848
Split HEV	2030	low	med	Midsize	CNG	1509	17659	683	0	1884	479	323	998	845	152	0	40	75	9	85	848
Split HEV	2030	low	med	Midsize	E85	1450	17010	768	0	1888	399	304	998	215	103	0	34	75	10	85	848
Split HEV	2030	low	med	Midsize	SI	1447	16984	768	0	1863	398	304	998	215	103	0	33	75	10	85	848
Conventional	2030	med	med	Midsize	CI	1325	17347	0	0	2390	35	0	1460	191	152	0	3	75	0	85	691
Conventional	2030	med	med	Midsize	CNG	1320	17549	0	0	1930	35	0	1375	1348	157	0	3	75	0	85	691
Conventional	2030	med	med	Midsize	E85	1251	16251	0	0	1789	35	0	1356	215	111	0	3	75	0	85	691
Conventional	2030	med	med	Midsize	SI	1254	16304	0	0	1827	35	0	1356	215	117	0	3	75	0	85	691
BEV100 DM	2030	med	med	Midsize		1162	16750	2484	0	0	497	0	520	0	0	0	41	75	69	85	691
BEV100	2030	med	med	Midsize		1101	16286	2486	0	0	551	0	0	0	0	0	45	0	69	85	691
BEV 200 DM	2030	med	med	Midsize		1213	19453	5113	0	0	571	0	520	0	0	0	47	75	114	85	691
BEV 200	2030	med	med	Midsize		1150	18968	5117	0	0	602	0	0	0	0	0	49	0	114	85	691
BEV300 DM	2030	med	med	Midsize		1277	22272	7904	0	0	600	0	520	0	0	0	49	75	176	85	691
BEV300	2030	med	med	Midsize		1216	21824	7937	0	0	639	0	0	0	0	0	52	0	177	85	691
EREV PHEV30	2030	med	med	Midsize	CI	1430	20690	1912	0	2344	524	477	1297	191	147	0	43	75	48	85	691
EREV PHEV30	2030	med	med	Midsize	CNG	1383	20204	1853	0	1829	510	463	1297	691	146	0	42	75	48	85	691
EREV PHEV30	2030	med	med	Midsize	E85	1341	19666	1802	0	1847	496	451	1297	215	97	0	40	75	47	85	691
EREV PHEV30	2030	med	med	Midsize	SI	1339	19660	1800	0	1845	495	450	1297	215	97	0	40	75	47	85	691
EREV PHEV40	2030	med	med	Midsize	CI	1447	20753	1959	0	2347	530	482	1297	191	148	0	43	75	64	85	691
EREV PHEV40	2030	med	med	Midsize	CNG	1400	20270	1899	0	1833	517	468	1297	694	147	0	42	75	63	85	691
EREV PHEV40	2030	med	med	Midsize	E85	1357	19724	1846	0	1850	501	456	1297	215	97	0	41	75	62	85	691
EREV PHEV40	2030	med	med	Midsize	SI	1354	19717	1844	0	1848	499	455	1297	215	97	0	41	75	61	85	691
FC Series HEV	2030	med	med	Midsize		1272	18255	768	2118	0	586	0	520	1118	0	95	48	75	8	85	691
FC Series PHEV10	2030	med	med	Midsize		1286	18403	818	2126	0	607	0	520	1095	0	97	50	75	20	85	691
FC Series PHEV20	2030	med	med	Midsize		1306	18548	947	2137	0	607	0	520	1101	0	98	50	75	38	85	691

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
FC Series PHEV30	2030	med	med	Midsize		1324	19289	1595	2149	0	604	0	520	1173	0	99	49	75	52	85	691
FC Series PHEV40	2030	med	med	Midsize		1344	19376	1658	2160	0	604	0	520	1186	0	101	49	75	69	85	691
Split PHEV10	2030	med	med	Midsize	CI	1388	19117	829	0	2358	371	422	998	191	149	0	30	75	22	85	691
Split PHEV10	2030	med	med	Midsize	CNG	1336	18595	790	0	1849	406	286	998	709	148	0	33	75	21	85	691
Split PHEV10	2030	med	med	Midsize	E85	1292	18035	762	0	1862	368	277	998	215	99	0	30	75	20	85	691
Split PHEV10	2030	med	med	Midsize	SI	1290	18033	762	0	1860	368	276	998	215	99	0	30	75	20	85	691
Split PHEV20	2030	med	med	Midsize	CI	1409	19361	1060	0	2362	371	428	998	191	149	0	30	75	42	85	691
Split PHEV20	2030	med	med	Midsize	CNG	1354	18789	984	0	1849	406	286	998	708	148	0	33	75	39	85	691
Split PHEV20	2030	med	med	Midsize	E85	1310	18237	963	0	1862	368	277	998	215	99	0	30	75	38	85	691
Split PHEV20	2030	med	med	Midsize	SI	1308	18233	963	0	1860	368	276	998	215	99	0	30	75	38	85	691
Split HEV	2030	med	med	Midsize	CI	1370	18820	683	0	2348	349	406	998	191	148	0	29	75	7	85	691
Split HEV	2030	med	med	Midsize	CNG	1323	18323	598	0	1842	443	279	998	700	148	0	36	75	6	85	691
Split HEV	2030	med	med	Midsize	E85	1276	17824	683	0	1853	353	266	998	215	97	0	29	75	8	85	691
Split HEV	2030	med	med	Midsize	SI	1274	17821	683	0	1851	353	266	998	215	97	0	29	75	8	85	691
Conventional	2045	high	med	Midsize	CI	1183	17765	0	0	2268	30	0	1234	165	151	0	3	75	0	85	549
Conventional	2045	high	med	Midsize	CNG	1150	17609	0	0	1633	30	0	1145	1086	154	0	3	75	0	85	549
Conventional	2045	high	med	Midsize	E85	1104	16691	0	0	1639	30	0	1127	185	106	0	3	75	0	85	549
Conventional	2045	high	med	Midsize	SI	1108	16743	0	0	1674	30	0	1131	185	112	0	3	75	0	85	549
BEV100 DM	2045	high	med	Midsize		987	16561	1693	0	0	359	0	447	0	0	0	30	75	47	85	549
BEV100	2045	high	med	Midsize		926	16166	1711	0	0	394	0	0	0	0	0	33	0	48	85	549
BEV 200 DM	2045	high	med	Midsize		1024	18387	3470	0	0	409	0	447	0	0	0	34	75	80	85	549
BEV 200	2045	high	med	Midsize		962	17981	3491	0	0	428	0	0	0	0	0	36	0	81	85	549
BEV300 DM	2045	high	med	Midsize		1068	20256	5323	0	0	425	0	447	0	0	0	35	75	123	85	549
BEV300	2045	high	med	Midsize		1007	19888	5375	0	0	451	0	0	0	0	0	38	0	124	85	549
EREV PHEV30	2045	high	med	Midsize	CI	1241	20248	1409	0	2204	381	344	1115	165	143	0	32	75	26	85	549
EREV PHEV30	2045	high	med	Midsize	CNG	1173	19460	1339	0	1535	363	327	1115	467	142	0	30	75	25	85	549
EREV PHEV30	2045	high	med	Midsize	E85	1151	19157	1314	0	1553	356	322	1115	185	90	0	30	75	25	85	549
EREV PHEV30	2045	high	med	Midsize	SI	1148	19150	1311	0	1551	355	321	1115	185	90	0	30	75	25	85	549

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
EREV PHEV40	2045	high	med	Midsize	CI	1249	20275	1430	0	2205	383	346	1115	165	143	0	32	75	34	85	549
EREV PHEV40	2045	high	med	Midsize	CNG	1181	19488	1358	0	1536	365	329	1115	471	142	0	30	75	33	85	549
EREV PHEV40	2045	high	med	Midsize	E85	1159	19185	1336	0	1554	358	324	1115	185	90	0	30	75	33	85	549
EREV PHEV40	2045	high	med	Midsize	SI	1156	19177	1332	0	1553	357	323	1115	185	90	0	30	75	33	85	549
FC Series HEV	2045	high	med	Midsize		1050	18008	526	1808	0	424	0	447	836	0	61	35	75	5	85	549
FC Series PHEV10	2045	high	med	Midsize		1056	18171	604	1811	0	438	0	447	819	0	61	36	75	11	85	549
FC Series PHEV20	2045	high	med	Midsize		1067	18195	620	1817	0	438	0	447	822	0	62	36	75	21	85	549
FC Series PHEV30	2045	high	med	Midsize		1078	18794	1145	1826	0	435	0	447	879	0	63	36	75	28	85	549
FC Series PHEV40	2045	high	med	Midsize		1087	18818	1159	1831	0	435	0	447	885	0	63	36	75	37	85	549
Split PHEV10	2045	high	med	Midsize	CI	1217	19097	633	0	2219	281	310	858	165	145	0	23	75	12	85	549
Split PHEV10	2045	high	med	Midsize	CNG	1149	18325	593	0	1554	304	207	858	499	144	0	25	75	12	85	549
Split PHEV10	2045	high	med	Midsize	E85	1122	17969	577	0	1561	288	195	858	185	92	0	24	75	11	85	549
Split PHEV10	2045	high	med	Midsize	SI	1119	17965	576	0	1560	286	194	858	185	92	0	24	75	11	85	549
Split PHEV20	2045	high	med	Midsize	CI	1230	19173	694	0	2214	312	303	858	165	144	0	26	75	24	85	549
Split PHEV20	2045	high	med	Midsize	CNG	1159	18387	656	0	1554	304	207	858	497	144	0	25	75	22	85	549
Split PHEV20	2045	high	med	Midsize	E85	1133	18041	640	0	1563	292	197	858	185	92	0	24	75	22	85	549
Split PHEV20	2045	high	med	Midsize	SI	1130	18036	639	0	1562	290	196	858	185	92	0	24	75	22	85	549
Split HEV	2045	high	med	Midsize	CI	1207	18859	526	0	2210	261	297	858	165	144	0	22	75	5	85	549
Split HEV	2045	high	med	Midsize	CNG	1142	18090	451	0	1546	319	199	858	492	143	0	27	75	4	85	549
Split HEV	2045	high	med	Midsize	E85	1113	17806	526	0	1560	261	194	858	185	91	0	22	75	5	85	549
Split HEV	2045	high	med	Midsize	SI	1109	17797	526	0	1558	255	193	858	185	91	0	21	75	5	85	549
Conventional	2045	low	med	Midsize	CI	1434	16124	0	0	2171	30	0	1296	165	155	0	3	75	0	85	797
Conventional	2045	low	med	Midsize	CNG	1431	16355	0	0	1680	30	0	1213	1333	159	0	3	75	0	85	797
Conventional	2045	low	med	Midsize	E85	1361	15068	0	0	1560	30	0	1198	185	115	0	3	75	0	85	797
Conventional	2045	low	med	Midsize	SI	1364	15113	0	0	1594	30	0	1196	185	121	0	3	75	0	85	797
BEV100 DM	2045	low	med	Midsize		1279	15670	2325	0	0	468	0	447	0	0	0	41	75	80	85	797
BEV100	2045	low	med	Midsize		1219	15286	2336	0	0	521	0	0	0	0	0	46	0	80	85	797
BEV 200 DM	2045	low	med	Midsize		1331	18185	4772	0	0	536	0	447	0	0	0	47	75	126	85	797

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
BEV 200	2045	low	med	Midsize		1270	17784	4788	0	0	567	0	0	0	0	0	50	0	127	85	797
BEV300 DM	2045	low	med	Midsize		1402	20814	7375	0	0	563	0	447	0	0	0	49	75	195	85	797
BEV300	2045	low	med	Midsize		1343	20470	7437	0	0	603	0	0	0	0	0	53	0	197	85	797
EREV PHEV30	2045	low	med	Midsize	CI	1550	19313	1903	0	2133	496	452	1115	165	150	0	43	75	58	85	797
EREV PHEV30	2045	low	med	Midsize	CNG	1512	18985	1858	0	1598	485	442	1115	776	149	0	43	75	58	85	797
EREV PHEV30	2045	low	med	Midsize	E85	1463	18324	1804	0	1613	471	430	1115	185	101	0	41	75	57	85	797
EREV PHEV30	2045	low	med	Midsize	SI	1461	18318	1802	0	1611	470	429	1115	185	101	0	41	75	57	85	797
EREV PHEV40	2045	low	med	Midsize	CI	1573	19367	1940	0	2136	502	458	1115	165	151	0	44	75	79	85	797
EREV PHEV40	2045	low	med	Midsize	CNG	1533	19044	1897	0	1602	491	448	1115	780	150	0	43	75	77	85	797
EREV PHEV40	2045	low	med	Midsize	E85	1484	18376	1842	0	1616	475	435	1115	185	102	0	42	75	76	85	797
EREV PHEV40	2045	low	med	Midsize	SI	1480	18371	1840	0	1614	476	434	1115	185	101	0	42	75	75	85	797
FC Series HEV	2045	low	med	Midsize		1399	17221	676	2020	0	545	0	447	1197	0	106	48	75	8	85	797
FC Series PHEV10	2045	low	med	Midsize		1415	17448	822	2028	0	562	0	447	1170	0	108	49	75	23	85	797
FC Series PHEV20	2045	low	med	Midsize		1440	17726	1083	2039	0	562	0	447	1176	0	110	49	75	45	85	797
FC Series PHEV30	2045	low	med	Midsize		1463	18316	1574	2052	0	559	0	447	1254	0	111	49	75	62	85	797
FC Series PHEV40	2045	low	med	Midsize		1488	18665	1897	2064	0	559	0	447	1269	0	113	49	75	84	85	797
Split PHEV10	2045	low	med	Midsize	CI	1500	17748	809	0	2141	342	390	858	165	151	0	30	75	26	85	797
Split PHEV10	2045	low	med	Midsize	CNG	1447	17258	773	0	1609	376	265	858	674	151	0	33	75	24	85	797
Split PHEV10	2045	low	med	Midsize	E85	1405	16708	748	0	1620	341	257	858	185	102	0	30	75	24	85	797
Split PHEV10	2045	low	med	Midsize	SI	1402	16705	748	0	1619	341	256	858	185	102	0	30	75	24	85	797
Split PHEV20	2045	low	med	Midsize	CI	1524	18150	1210	0	2141	342	390	858	165	151	0	30	75	50	85	797
Split PHEV20	2045	low	med	Midsize	CNG	1470	17628	1141	0	1611	376	267	858	672	151	0	33	75	47	85	797
Split PHEV20	2045	low	med	Midsize	E85	1428	17079	1117	0	1621	341	258	858	185	103	0	30	75	46	85	797
Split PHEV20	2045	low	med	Midsize	SI	1425	17076	1116	0	1620	341	257	858	185	102	0	30	75	46	85	797
Split HEV	2045	low	med	Midsize	CI	1478	17416	601	0	2133	326	378	858	165	150	0	29	75	7	85	797
Split HEV	2045	low	med	Midsize	CNG	1428	16983	601	0	1605	378	260	858	663	150	0	33	75	7	85	797
Split HEV	2045	low	med	Midsize	E85	1385	16456	601	0	1615	334	251	858	185	101	0	29	75	7	85	797
Split HEV	2045	low	med	Midsize	SI	1384	16444	601	0	1611	329	248	858	185	101	0	29	75	8	85	797

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Conventional	2045	med	med	Midsize	CI	1267	17285	0	0	2288	30	0	1259	165	153	0	3	75	0	85	631
Conventional	2045	med	med	Midsize	CNG	1244	17195	0	0	1656	30	0	1164	1163	156	0	3	75	0	85	631
Conventional	2045	med	med	Midsize	E85	1190	16075	0	0	1535	30	0	1147	185	110	0	3	75	0	85	631
Conventional	2045	med	med	Midsize	SI	1195	16123	0	0	1569	30	0	1149	185	117	0	3	75	0	85	631
BEV100 DM	2045	med	med	Midsize		1087	16341	1974	0	0	400	0	447	0	0	0	34	75	61	85	631
BEV100	2045	med	med	Midsize		1026	15940	1979	0	0	441	0	0	0	0	0	38	0	61	85	631
BEV 200 DM	2045	med	med	Midsize		1131	18478	4054	0	0	456	0	447	0	0	0	39	75	100	85	631
BEV 200	2045	med	med	Midsize		1068	18049	4049	0	0	480	0	0	0	0	0	41	0	100	85	631
BEV300 DM	2045	med	med	Midsize		1187	20691	6244	0	0	479	0	447	0	0	0	41	75	154	85	631
BEV300	2045	med	med	Midsize		1125	20292	6263	0	0	509	0	0	0	0	0	43	0	155	85	631
EREV PHEV30	2045	med	med	Midsize	CI	1346	20021	1597	0	2227	423	385	1115	165	146	0	36	75	38	85	631
EREV PHEV30	2045	med	med	Midsize	CNG	1290	19357	1535	0	1559	409	371	1115	584	145	0	35	75	37	85	631
EREV PHEV30	2045	med	med	Midsize	E85	1256	18918	1498	0	1576	399	363	1115	185	94	0	34	75	36	85	631
EREV PHEV30	2045	med	med	Midsize	SI	1253	18910	1495	0	1574	398	362	1115	185	94	0	34	75	36	85	631
EREV PHEV40	2045	med	med	Midsize	CI	1358	20063	1629	0	2229	427	389	1115	165	146	0	36	75	50	85	631
EREV PHEV40	2045	med	med	Midsize	CNG	1302	19399	1567	0	1561	412	375	1115	585	145	0	35	75	49	85	631
EREV PHEV40	2045	med	med	Midsize	E85	1269	18960	1530	0	1578	403	367	1115	185	95	0	34	75	48	85	631
EREV PHEV40	2045	med	med	Midsize	SI	1266	18953	1527	0	1576	402	366	1115	185	95	0	34	75	48	85	631
FC Series HEV	2045	med	med	Midsize		1174	17835	601	1896	0	471	0	447	994	0	79	40	75	6	85	631
FC Series PHEV10	2045	med	med	Midsize		1185	18001	683	1902	0	487	0	447	972	0	80	42	75	16	85	631
FC Series PHEV20	2045	med	med	Midsize		1201	18111	781	1910	0	487	0	447	976	0	81	42	75	30	85	631
FC Series PHEV30	2045	med	med	Midsize		1214	18733	1319	1919	0	483	0	447	1043	0	82	41	75	40	85	631
FC Series PHEV40	2045	med	med	Midsize		1229	18785	1355	1927	0	483	0	447	1052	0	83	41	75	53	85	631
Split PHEV10	2045	med	med	Midsize	CI	1313	18713	699	0	2239	303	341	858	165	147	0	26	75	18	85	631
Split PHEV10	2045	med	med	Midsize	CNG	1253	18021	661	0	1575	331	230	858	587	147	0	28	75	17	85	631
Split PHEV10	2045	med	med	Midsize	E85	1218	17570	641	0	1588	300	223	858	185	96	0	26	75	16	85	631
Split PHEV10	2045	med	med	Midsize	SI	1215	17567	641	0	1586	299	222	858	185	96	0	26	75	16	85	631
Split PHEV20	2045	med	med	Midsize	CI	1331	18897	869	0	2235	329	335	858	165	147	0	28	75	34	85	631

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Split PHEV20	2045	med	med	Midsize	CNG	1268	18176	817	0	1575	331	230	858	585	147	0	28	75	32	85	631
Split PHEV20	2045	med	med	Midsize	E85	1234	17744	802	0	1585	319	220	858	185	96	0	27	75	31	85	631
Split PHEV20	2045	med	med	Midsize	SI	1231	17738	801	0	1584	317	220	858	185	96	0	27	75	31	85	631
Split HEV	2045	med	med	Midsize	CI	1296	18410	526	0	2230	286	327	858	165	146	0	24	75	5	85	631
Split HEV	2045	med	med	Midsize	CNG	1239	17771	526	0	1568	323	222	858	580	146	0	28	75	5	85	631
Split HEV	2045	med	med	Midsize	E85	1205	17343	526	0	1581	288	215	858	185	95	0	25	75	6	85	631
Split HEV	2045	med	med	Midsize	SI	1202	17339	526	0	1579	288	215	858	185	95	0	25	75	6	85	631
Conventional	2010	low	high	Midsize	CI	1647	15666	39	0	2490	0	0	1503	213	163	0		75	0	85	1000
Conventional	2010	low	high	Midsize	CNG	1704	16937	39	0	1183	0	0	1361	3446	167	0		75	0	85	1000
Conventional	2010	low	high	Midsize	E85	1574	13699	39	0	1186	0	0	1335	239	124	0		75	0	85	1000
Conventional	2010	low	high	Midsize	SI	1580	13743	39	0	1213	0	0	1334	239	132	0		75	0	85	1000
BEV100 DM	2010	low	high	Midsize		1671	21853	7840	0	0	1919	0	540	0	0	0	94	75	216	85	1000
BEV100	2010	low	high	Midsize		1621	21721	8009	0	0	2159	0	0	0	0	0	105	0	220	85	1000
BEV 200 DM	2010	low	high	Midsize		1830	31312	16931	0	0	2288	0	540	0	0	0	111	75	358	85	1000
BEV 200	2010	low	high	Midsize		1784	31332	17279	0	0	2499	0	0	0	0	0	122	0	366	85	1000
BEV300 DM	2010	low	high	Midsize		2072	42327	27678	0	0	2555	0	540	0	0	0	125	75	586	85	1000
BEV300	2010	low	high	Midsize		2043	43054	28617	0	0	2884	0	0	0	0	0	141	0	606	85	1000
EREV PHEV30	2010	low	high	Midsize	CI	1970	26428	6140	0	2435	2060	1802	1347	213	158	0	100	75	162	85	1000
EREV PHEV30	2010	low	high	Midsize	CNG	2020	27476	6232	0	1100	2127	1843	1347	2864	159	0	104	75	165	85	1000
EREV PHEV30	2010	low	high	Midsize	E85	1881	24314	5998	0	1102	1948	1728	1347	239	113	0	95	75	159	85	1000
EREV PHEV30	2010	low	high	Midsize	SI	1876	24266	5989	0	1074	1941	1725	1347	239	112	0	95	75	158	85	1000
EREV PHEV40	2010	low	high	Midsize	CI	2039	27376	6822	0	2449	2241	1862	1347	213	159	0	109	75	218	85	1000
EREV PHEV40	2010	low	high	Midsize	CNG	2092	28526	6949	0	1114	2315	1907	1347	2925	160	0	113	75	222	85	1000
EREV PHEV40	2010	low	high	Midsize	E85	1945	25173	6617	0	1114	2113	1785	1347	239	114	0	103	75	211	85	1000
EREV PHEV40	2010	low	high	Midsize	SI	1942	25130	6611	0	1086	2107	1782	1347	239	114	0	103	75	211	85	1000
FC Series HEV	2010	low	high	Midsize		1763	25175	1724	5722	0	2040	0	540	3869	0	131	99	75	22	85	1000
FC Series PHEV10	2010	low	high	Midsize		1833	26761	2908	5802	0	2184	0	540	3797	0	140	106	75	79	85	1000
FC Series PHEV20	2010	low	high	Midsize		1920	29068	5052	5898	0	2184	0	540	3863	0	146	106	75	157	85	1000

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
FC Series PHEV30	2010	low	high	Midsize		1949	30922	6589	5934	0	2139	0	540	4166	0	148	104	75	174	85	1000
FC Series PHEV40	2010	low	high	Midsize		2024	32013	7432	6016	0	2185	0	540	4288	0	154	106	75	237	85	1000
Split PHEV10	2010	low	high	Midsize	CI	1847	22187	3239	0	2446	1286	1549	1037	213	159	0	63	75	88	85	1000
Split PHEV10	2010	low	high	Midsize	CNG	1873	22665	3116	0	1126	1429	1124	1037	2883	161	0	70	75	84	85	1000
Split PHEV10	2010	low	high	Midsize	E85	1739	19609	2945	0	1116	1299	1038	1037	239	115	0	63	75	80	85	1000
Split PHEV10	2010	low	high	Midsize	SI	1736	19576	2943	0	1088	1297	1036	1037	239	115	0	63	75	80	85	1000
Split PHEV20	2010	low	high	Midsize	CI	1940	24678	5632	0	2463	1286	1615	1037	213	161	0	63	75	175	85	1000
Split PHEV20	2010	low	high	Midsize	CNG	1960	25042	5398	0	1145	1429	1172	1037	2902	163	0	70	75	167	85	1000
Split PHEV20	2010	low	high	Midsize	E85	1820	21825	5101	0	1131	1299	1076	1037	239	117	0	63	75	158	85	1000
Split PHEV20	2010	low	high	Midsize	SI	1817	21796	5104	0	1103	1297	1075	1037	239	117	0	63	75	158	85	1000
Split HEV	2010	low	high	Midsize	CI	1765	19905	1455	0	2419	1195	1445	1037	213	156	0	58	75	19	85	1000
Split HEV	2010	low	high	Midsize	CNG	1805	20762	1509	0	1111	1534	1086	1037	2791	160	0	75	75	19	85	1000
Split HEV	2010	low	high	Midsize	E85	1673	17872	1509	0	1100	1316	995	1037	239	112	0	64	75	19	85	1000
Split HEV	2010	low	high	Midsize	SI	1669	17777	1455	0	1072	1305	993	1037	239	112	0	64	75	18	85	1000
Conventional	2015	high	high	Midsize	CI	1450	16252	39	0	2324	0	0	1084	203	159	0		75	0	85	807
Conventional	2015	high	high	Midsize	CNG	1452	16886	39	0	1071	0	0	967	2678	161	0		75	0	85	807
Conventional	2015	high	high	Midsize	E85	1375	15281	39	0	1938	0	0	950	228	118	0		75	0	85	807
Conventional	2015	high	high	Midsize	SI	1381	15341	39	0	1971	0	0	956	228	126	0		75	0	85	807
BEV100 DM	2015	high	high	Midsize		1361	18995	4815	0	0	979	0	514	0	0	0	70	75	123	85	807
BEV100	2015	high	high	Midsize		1307	18733	4945	0	0	1102	0	0	0	0	0	78	0	126	85	807
BEV 200 DM	2015	high	high	Midsize		1455	24523	10179	0	0	1144	0	514	0	0	0	81	75	206	85	807
BEV 200	2015	high	high	Midsize		1401	24305	10377	0	0	1241	0	0	0	0	0	88	0	210	85	807
BEV300 DM	2015	high	high	Midsize		1581	30512	16075	0	0	1237	0	514	0	0	0	88	75	325	85	807
BEV300	2015	high	high	Midsize		1534	30579	16531	0	0	1362	0	0	0	0	0	97	0	334	85	807
EREV PHEV30	2015	high	high	Midsize	CI	1637	21881	2776	0	2243	1002	919	1281	203	151	0	71	75	81	85	807
EREV PHEV30	2015	high	high	Midsize	CNG	1608	21603	2747	0	958	988	905	1281	1687	150	0	70	75	80	85	807
EREV PHEV30	2015	high	high	Midsize	E85	1548	20034	2688	0	974	956	875	1281	228	102	0	68	75	79	85	807
EREV PHEV30	2015	high	high	Midsize	SI	1545	20387	2686	0	1334	953	873	1281	228	102	0	68	75	79	85	807

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
EREV PHEV40	2015	high	high	Midsize	CI	1668	22075	2925	0	2249	1018	937	1281	203	151	0	73	75	108	85	807
EREV PHEV40	2015	high	high	Midsize	CNG	1639	21804	2897	0	964	1007	922	1281	1694	151	0	72	75	106	85	807
EREV PHEV40	2015	high	high	Midsize	E85	1577	20208	2821	0	980	971	892	1281	228	103	0	69	75	104	85	807
EREV PHEV40	2015	high	high	Midsize	SI	1573	20560	2818	0	1340	968	890	1281	228	103	0	69	75	104	85	807
FC Series HEV	2015	high	high	Midsize		1466	20996	854	3843	0	1132	0	514	2160	0	111	81	75	11	85	807
FC Series PHEV10	2015	high	high	Midsize		1496	21843	1472	3870	0	1190	0	514	2123	0	115	85	75	35	85	807
FC Series PHEV20	2015	high	high	Midsize		1532	22846	2425	3902	0	1190	0	514	2141	0	118	85	75	67	85	807
FC Series PHEV30	2015	high	high	Midsize		1564	23732	3134	3934	0	1182	0	514	2281	0	120	84	75	92	85	807
FC Series PHEV40	2015	high	high	Midsize		1597	23956	3284	3963	0	1182	0	514	2327	0	122	84	75	121	85	807
Split PHEV10	2015	high	high	Midsize	CI	1568	20054	1618	0	2264	702	820	986	203	153	0	50	75	38	85	807
Split PHEV10	2015	high	high	Midsize	CNG	1531	19656	1531	0	984	773	562	986	1785	153	0	55	75	36	85	807
Split PHEV10	2015	high	high	Midsize	E85	1466	17972	1487	0	996	702	544	986	228	105	0	50	75	35	85	807
Split PHEV10	2015	high	high	Midsize	SI	1463	18329	1486	0	1356	701	543	986	228	105	0	50	75	35	85	807
Split PHEV20	2015	high	high	Midsize	CI	1606	21150	2682	0	2271	702	838	986	203	153	0	50	75	74	85	807
Split PHEV20	2015	high	high	Midsize	CNG	1566	20667	2515	0	991	773	575	986	1788	153	0	55	75	70	85	807
Split PHEV20	2015	high	high	Midsize	E85	1502	18983	2474	0	1004	702	556	986	228	106	0	50	75	69	85	807
Split PHEV20	2015	high	high	Midsize	SI	1499	19339	2473	0	1364	701	555	986	228	106	0	50	75	69	85	807
Split HEV	2015	high	high	Midsize	CI	1532	18910	768	0	2251	645	787	986	203	151	0	46	75	10	85	807
Split HEV	2015	high	high	Midsize	CNG	1505	18628	683	0	979	825	553	986	1748	152	0	59	75	9	85	807
Split HEV	2015	high	high	Midsize	E85	1436	17018	768	0	984	684	523	986	228	103	0	49	75	10	85	807
Split HEV	2015	high	high	Midsize	SI	1431	17281	683	0	1344	675	522	986	228	103	0	48	75	9	85	807
Conventional	2015	low	high	Midsize	CI	1579	15803	39	0	2352	0	0	1417	203	162	0		75	0	85	933
Conventional	2015	low	high	Midsize	CNG	1603	16754	39	0	1106	0	0	1286	3014	165	0		75	0	85	933
Conventional	2015	low	high	Midsize	E85	1506	13941	39	0	1110	0	0	1263	228	122	0		75	0	85	933
Conventional	2015	low	high	Midsize	SI	1511	13998	39	0	1142	0	0	1267	228	130	0		75	0	85	933
BEV100 DM	2015	low	high	Midsize		1558	19294	5795	0	0	1127	0	514	0	0	0	87	75	177	85	933
BEV100	2015	low	high	Midsize		1507	19042	5910	0	0	1274	0	0	0	0	0	98	0	180	85	933
BEV 200 DM	2015	low	high	Midsize		1688	26102	12393	0	0	1337	0	514	0	0	0	103	75	291	85	933

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
BEV 200	2015	low	high	Midsize		1637	25915	12601	0	0	1457	0	0	0	0	0	112	0	296	85	933
BEV300 DM	2015	low	high	Midsize		1878	33839	19984	0	0	1484	0	514	0	0	0	115	75	469	85	933
BEV300	2015	low	high	Midsize		1835	33940	20455	0	0	1628	0	0	0	0	0	126	0	480	85	933
EREV PHEV30	2015	low	high	Midsize	CI	1855	22809	4091	0	2296	1185	1079	1281	203	156	0	91	75	130	85	933
EREV PHEV30	2015	low	high	Midsize	CNG	1858	23130	4093	0	1018	1186	1081	1281	2236	156	0	92	75	130	85	933
EREV PHEV30	2015	low	high	Midsize	E85	1766	20896	3974	0	1027	1128	1032	1281	228	110	0	87	75	126	85	933
EREV PHEV30	2015	low	high	Midsize	SI	1763	20847	3969	0	1001	1111	1031	1281	228	110	0	86	75	126	85	933
EREV PHEV40	2015	low	high	Midsize	CI	1908	23173	4331	0	2306	1262	1108	1281	203	157	0	97	75	173	85	933
EREV PHEV40	2015	low	high	Midsize	CNG	1912	23513	4335	0	1028	1265	1110	1281	2255	157	0	98	75	173	85	933
EREV PHEV40	2015	low	high	Midsize	E85	1816	21237	4206	0	1037	1193	1061	1281	228	111	0	92	75	168	85	933
EREV PHEV40	2015	low	high	Midsize	SI	1814	21203	4203	0	1011	1190	1059	1281	228	111	0	92	75	168	85	933
FC Series HEV	2015	low	high	Midsize		1662	20921	898	4043	0	1238	0	514	2565	0	125	96	75	20	85	933
FC Series PHEV10	2015	low	high	Midsize		1711	22265	2009	4085	0	1308	0	514	2506	0	132	101	75	59	85	933
FC Series PHEV20	2015	low	high	Midsize		1773	23731	3388	4137	0	1308	0	514	2541	0	136	101	75	116	85	933
FC Series PHEV30	2015	low	high	Midsize		1806	24920	4373	4167	0	1289	0	514	2720	0	139	99	75	139	85	933
FC Series PHEV40	2015	low	high	Midsize		1862	25348	4688	4212	0	1289	0	514	2787	0	142	99	75	188	85	933
Split PHEV10	2015	low	high	Midsize	CI	1749	20106	2247	0	2305	774	924	986	203	157	0	60	75	66	85	933
Split PHEV10	2015	low	high	Midsize	CNG	1733	20109	2134	0	1038	857	654	986	2210	158	0	66	75	63	85	933
Split PHEV10	2015	low	high	Midsize	E85	1642	17915	2047	0	1039	780	617	986	228	111	0	60	75	60	85	933
Split PHEV10	2015	low	high	Midsize	SI	1640	17886	2047	0	1012	779	616	986	228	111	0	60	75	60	85	933
Split PHEV20	2015	low	high	Midsize	CI	1817	21697	3787	0	2316	774	953	986	203	158	0	60	75	130	85	933
Split PHEV20	2015	low	high	Midsize	CNG	1796	21616	3587	0	1051	857	676	986	2223	159	0	66	75	123	85	933
Split PHEV20	2015	low	high	Midsize	E85	1703	19346	3447	0	1049	780	634	986	228	113	0	60	75	118	85	933
Split PHEV20	2015	low	high	Midsize	SI	1701	19318	3447	0	1022	779	633	986	228	113	0	60	75	118	85	933
Split HEV	2015	low	high	Midsize	CI	1692	18325	778	0	2285	730	874	986	203	155	0	56	75	19	85	933
Split HEV	2015	low	high	Midsize	CNG	1687	18535	778	0	1029	899	638	986	2160	157	0	69	75	18	85	933
Split HEV	2015	low	high	Midsize	E85	1598	16440	778	0	1027	790	597	986	228	110	0	61	75	18	85	933
Split HEV	2015	low	high	Midsize	SI	1594	16365	748	0	1001	773	596	986	228	110	0	60	75	17	85	933

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Conventional	2015	med	high	Midsize	CI	1485	16336	39	0	2329	0	0	1392	203	159	0		75	0	85	842
Conventional	2015	med	high	Midsize	CNG	1502	17206	39	0	1084	0	0	1271	2910	163	0		75	0	85	842
Conventional	2015	med	high	Midsize	E85	1412	14749	39	0	1337	0	0	1250	228	119	0		75	0	85	842
Conventional	2015	med	high	Midsize	SI	1416	14786	39	0	1359	0	0	1248	228	126	0		75	0	85	842
BEV100 DM	2015	med	high	Midsize		1425	19299	5295	0	0	1035	0	514	0	0	0	77	75	145	85	842
BEV100	2015	med	high	Midsize		1371	19007	5385	0	0	1167	0	0	0	0	0	86	0	147	85	842
BEV 200 DM	2015	med	high	Midsize		1535	25452	11259	0	0	1223	0	514	0	0	0	91	75	241	85	842
BEV 200	2015	med	high	Midsize		1480	25186	11406	0	0	1324	0	0	0	0	0	98	0	244	85	842
BEV300 DM	2015	med	high	Midsize		1685	32234	17938	0	0	1327	0	514	0	0	0	98	75	384	85	842
BEV300	2015	med	high	Midsize		1637	32213	18301	0	0	1457	0	0	0	0	0	108	0	391	85	842
EREV PHEV30	2015	med	high	Midsize	CI	1711	22645	3595	0	2265	1072	984	1281	203	153	0	79	75	102	85	842
EREV PHEV30	2015	med	high	Midsize	CNG	1697	22669	3579	0	983	1069	977	1281	1963	153	0	79	75	101	85	842
EREV PHEV30	2015	med	high	Midsize	E85	1621	20770	3492	0	995	1025	938	1281	228	105	0	76	75	99	85	842
EREV PHEV30	2015	med	high	Midsize	SI	1618	20734	3490	0	969	1018	937	1281	228	105	0	75	75	99	85	842
EREV PHEV40	2015	med	high	Midsize	CI	1748	22929	3826	0	2272	1092	1005	1281	203	153	0	81	75	136	85	842
EREV PHEV40	2015	med	high	Midsize	CNG	1735	22953	3806	0	990	1082	998	1281	1976	153	0	80	75	135	85	842
EREV PHEV40	2015	med	high	Midsize	E85	1658	21026	3702	0	1002	1042	958	1281	228	106	0	77	75	132	85	842
EREV PHEV40	2015	med	high	Midsize	SI	1656	20995	3701	0	976	1039	957	1281	228	106	0	77	75	132	85	842
FC Series HEV	2015	med	high	Midsize		1530	21095	854	3924	0	1167	0	514	2375	0	116	86	75	14	85	842
FC Series PHEV10	2015	med	high	Midsize		1569	22304	1833	3958	0	1224	0	514	2332	0	122	91	75	44	85	842
FC Series PHEV20	2015	med	high	Midsize		1616	23623	3087	3999	0	1224	0	514	2356	0	125	91	75	87	85	842
FC Series PHEV30	2015	med	high	Midsize		1652	24731	4001	4034	0	1213	0	514	2514	0	128	90	75	113	85	842
FC Series PHEV40	2015	med	high	Midsize		1694	25039	4221	4070	0	1213	0	514	2567	0	131	90	75	150	85	842
Split PHEV10	2015	med	high	Midsize	CI	1624	20331	2042	0	2278	724	856	986	203	154	0	54	75	49	85	842
Split PHEV10	2015	med	high	Midsize	CNG	1599	20139	1934	0	1005	798	598	986	2004	155	0	59	75	47	85	842
Split PHEV10	2015	med	high	Midsize	E85	1520	18185	1862	0	1011	726	569	986	228	107	0	54	75	45	85	842
Split PHEV10	2015	med	high	Midsize	SI	1518	18158	1863	0	984	725	568	986	228	107	0	54	75	45	85	842
Split PHEV20	2015	med	high	Midsize	CI	1674	21726	3410	0	2284	724	872	986	203	155	0	54	75	96	85	842

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Split PHEV20	2015	med	high	Midsize	CNG	1645	21465	3225	0	1014	798	614	986	2010	156	0	59	75	91	85	842
Split PHEV20	2015	med	high	Midsize	E85	1565	19450	3110	0	1016	726	578	986	228	108	0	54	75	88	85	842
Split PHEV20	2015	med	high	Midsize	SI	1563	19422	3110	0	990	725	577	986	228	108	0	54	75	88	85	842
Split HEV	2015	med	high	Midsize	CI	1580	18769	768	0	2262	687	815	986	203	152	0	51	75	13	85	842
Split HEV	2015	med	high	Midsize	CNG	1561	18723	768	0	997	808	584	986	1950	154	0	60	75	12	85	842
Split HEV	2015	med	high	Midsize	E85	1484	16868	768	0	1000	716	550	986	228	106	0	53	75	12	85	842
Split HEV	2015	med	high	Midsize	SI	1480	16831	768	0	973	708	549	986	228	105	0	52	75	12	85	842
Conventional	2020	high	high	Midsize	CI	1385	16889	39	0	2446	0	0	1277	193	156	0		75	0	85	746
Conventional	2020	high	high	Midsize	CNG	1380	17570	39	0	1820	0	0	1174	2040	160	0		75	0	85	746
Conventional	2020	high	high	Midsize	E85	1311	15725	39	0	1825	0	0	1154	216	115	0		75	0	85	746
Conventional	2020	high	high	Midsize	SI	1315	15789	39	0	1870	0	0	1156	216	122	0		75	0	85	746
BEV100 DM	2020	high	high	Midsize		1240	16809	2757	0	0	602	0	489	0	0	0	52	75	81	85	746
BEV100	2020	high	high	Midsize		1183	16454	2824	0	0	668	0	0	0	0	0	58	0	83	85	746
BEV 200 DM	2020	high	high	Midsize		1309	19920	5777	0	0	694	0	489	0	0	0	60	75	142	85	746
BEV 200	2020	high	high	Midsize		1249	19552	5854	0	0	737	0	0	0	0	0	64	0	143	85	746
BEV300 DM	2020	high	high	Midsize		1391	23165	8980	0	0	735	0	489	0	0	0	64	75	220	85	746
BEV300	2020	high	high	Midsize		1335	22901	9150	0	0	790	0	0	0	0	0	69	0	224	85	746
EREV PHEV30	2020	high	high	Midsize	CI	1518	20679	2030	0	2370	621	571	1219	193	149	0	54	75	57	85	746
EREV PHEV30	2020	high	high	Midsize	CNG	1475	20481	1978	0	1703	607	557	1219	1134	148	0	53	75	56	85	746
EREV PHEV30	2020	high	high	Midsize	E85	1429	19488	1920	0	1720	590	542	1219	216	99	0	51	75	56	85	746
EREV PHEV30	2020	high	high	Midsize	SI	1427	19481	1917	0	1718	589	541	1219	216	99	0	51	75	56	85	746
EREV PHEV40	2020	high	high	Midsize	CI	1538	20754	2083	0	2374	628	578	1219	193	149	0	55	75	76	85	746
EREV PHEV40	2020	high	high	Midsize	CNG	1495	20558	2032	0	1707	615	564	1219	1135	148	0	53	75	75	85	746
EREV PHEV40	2020	high	high	Midsize	E85	1448	19562	1975	0	1724	597	549	1219	216	99	0	52	75	73	85	746
EREV PHEV40	2020	high	high	Midsize	SI	1445	19551	1971	0	1722	593	548	1219	216	99	0	51	75	73	85	746
FC Series HEV	2020	high	high	Midsize		1355	18838	676	2793	0	713	0	489	1318	0	101	62	75	8	85	746
FC Series PHEV10	2020	high	high	Midsize		1373	19136	864	2805	0	741	0	489	1289	0	103	64	75	24	85	746
FC Series PHEV20	2020	high	high	Midsize		1398	19583	1285	2821	0	741	0	489	1298	0	105	64	75	46	85	746

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
FC Series PHEV30	2020	high	high	Midsize		1421	20147	1745	2839	0	737	0	489	1375	0	106	64	75	64	85	746
FC Series PHEV40	2020	high	high	Midsize		1446	20486	2049	2856	0	737	0	489	1394	0	108	64	75	85	85	746
Split PHEV10	2020	high	high	Midsize	CI	1466	19050	900	0	2389	441	510	938	193	150	0	38	75	26	85	746
Split PHEV10	2020	high	high	Midsize	CNG	1420	18836	849	0	1727	484	348	938	1208	150	0	42	75	25	85	746
Split PHEV10	2020	high	high	Midsize	E85	1369	17777	829	0	1740	439	337	938	216	102	0	38	75	24	85	746
Split PHEV10	2020	high	high	Midsize	SI	1367	17773	829	0	1738	438	336	938	216	102	0	38	75	24	85	746
Split PHEV20	2020	high	high	Midsize	CI	1493	19598	1423	0	2396	441	522	938	193	151	0	38	75	51	85	746
Split PHEV20	2020	high	high	Midsize	CNG	1444	19322	1326	0	1729	484	351	938	1209	151	0	42	75	47	85	746
Split PHEV20	2020	high	high	Midsize	E85	1394	18283	1316	0	1747	439	346	938	216	103	0	38	75	47	85	746
Split PHEV20	2020	high	high	Midsize	SI	1392	18279	1315	0	1745	438	345	938	216	103	0	38	75	47	85	746
Split HEV	2020	high	high	Midsize	CI	1443	18582	601	0	2378	409	492	938	193	149	0	36	75	7	85	746
Split HEV	2020	high	high	Midsize	CNG	1401	18446	601	0	1721	474	341	938	1191	150	0	41	75	7	85	746
Split HEV	2020	high	high	Midsize	E85	1348	17399	601	0	1728	420	323	938	216	100	0	36	75	8	85	746
Split HEV	2020	high	high	Midsize	SI	1346	17396	601	0	1726	419	323	938	216	100	0	36	75	8	85	746
Conventional	2020	low	high	Midsize	CI	1560	15656	39	0	2231	0	0	1347	193	161	0		75	0	85	916
Conventional	2020	low	high	Midsize	CNG	1578	16106	39	0	1046	0	0	1224	2406	164	0		75	0	85	916
Conventional	2020	low	high	Midsize	E85	1487	13902	39	0	1055	0	0	1206	216	122	0		75	0	85	916
Conventional	2020	low	high	Midsize	SI	1493	13945	39	0	1081	0	0	1207	216	130	0		75	0	85	916
BEV100 DM	2020	low	high	Midsize		1501	16539	3482	0	0	726	0	489	0	0	0	67	75	157	85	916
BEV100	2020	low	high	Midsize		1447	16207	3545	0	0	819	0	0	0	0	0	76	0	159	85	916
BEV 200 DM	2020	low	high	Midsize		1612	20575	7388	0	0	856	0	489	0	0	0	79	75	256	85	916
BEV 200	2020	low	high	Midsize		1557	20249	7479	0	0	928	0	0	0	0	0	86	0	259	85	916
BEV300 DM	2020	low	high	Midsize		1772	25063	11796	0	0	936	0	489	0	0	0	87	75	408	85	916
BEV300	2020	low	high	Midsize		1723	24892	12027	0	0	1023	0	0	0	0	0	95	0	416	85	916
EREV PHEV30	2020	low	high	Midsize	CI	1768	20168	2541	0	2170	751	689	1219	193	154	0	70	75	102	85	916
EREV PHEV30	2020	low	high	Midsize	CNG	1760	20021	2532	0	951	752	686	1219	1688	154	0	70	75	101	85	916
EREV PHEV30	2020	low	high	Midsize	E85	1680	18386	2422	0	963	721	658	1219	216	107	0	67	75	99	85	916
EREV PHEV30	2020	low	high	Midsize	SI	1676	18351	2417	0	937	718	657	1219	216	107	0	66	75	99	85	916

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
EREV PHEV40	2020	low	high	Midsize	CI	1804	20477	2807	0	2176	768	703	1219	193	155	0	71	75	135	85	916
EREV PHEV40	2020	low	high	Midsize	CNG	1797	20342	2803	0	959	763	701	1219	1702	155	0	71	75	135	85	916
EREV PHEV40	2020	low	high	Midsize	E85	1715	18724	2727	0	969	731	672	1219	216	108	0	68	75	131	85	916
EREV PHEV40	2020	low	high	Midsize	SI	1712	18695	2723	0	944	731	671	1219	216	108	0	68	75	131	85	916
FC Series HEV	2020	low	high	Midsize		1604	18496	826	2979	0	810	0	489	1663	0	122	75	75	14	85	916
FC Series PHEV10	2020	low	high	Midsize		1635	18948	1161	2998	0	842	0	489	1629	0	127	78	75	40	85	916
FC Series PHEV20	2020	low	high	Midsize		1678	19696	1869	3024	0	842	0	489	1642	0	130	78	75	79	85	916
FC Series PHEV30	2020	low	high	Midsize		1719	20239	2261	3052	0	837	0	489	1758	0	133	78	75	109	85	916
FC Series PHEV40	2020	low	high	Midsize		1759	21040	3006	3075	0	837	0	489	1791	0	136	78	75	144	85	916
Split PHEV10	2020	low	high	Midsize	CI	1679	18292	1294	0	2177	500	590	938	193	155	0	46	75	45	85	916
Split PHEV10	2020	low	high	Midsize	CNG	1657	17943	1230	0	969	551	415	938	1651	156	0	51	75	43	85	916
Split PHEV10	2020	low	high	Midsize	E85	1578	16388	1187	0	973	502	393	938	216	109	0	46	75	41	85	916
Split PHEV10	2020	low	high	Midsize	SI	1575	16360	1186	0	947	501	392	938	216	109	0	46	75	41	85	916
Split PHEV20	2020	low	high	Midsize	CI	1724	19089	2068	0	2183	500	601	938	193	156	0	46	75	88	85	916
Split PHEV20	2020	low	high	Midsize	CNG	1699	18700	1963	0	977	551	424	938	1654	157	0	51	75	83	85	916
Split PHEV20	2020	low	high	Midsize	E85	1620	17112	1895	0	979	502	400	938	216	110	0	46	75	81	85	916
Split PHEV20	2020	low	high	Midsize	SI	1617	17084	1894	0	954	501	400	938	216	110	0	46	75	81	85	916
Split HEV	2020	low	high	Midsize	CI	1640	17505	676	0	2164	479	567	938	193	154	0	44	75	12	85	916
Split HEV	2020	low	high	Midsize	CNG	1624	17250	676	0	963	570	407	938	1611	155	0	53	75	11	85	916
Split HEV	2020	low	high	Midsize	E85	1547	15753	676	0	965	498	384	938	216	108	0	46	75	11	85	916
Split HEV	2020	low	high	Midsize	SI	1542	15714	676	0	940	486	383	938	216	108	0	45	75	11	85	916
Conventional	2020	med	high	Midsize	CI	1434	16501	39	0	2201	0	0	1437	193	158	0		75	0	85	793
Conventional	2020	med	high	Midsize	CNG	1440	16805	39	0	1010	0	0	1322	2245	160	0		75	0	85	793
Conventional	2020	med	high	Midsize	E85	1359	15102	39	0	1362	0	0	1303	216	116	0		75	0	85	793
Conventional	2020	med	high	Midsize	SI	1363	15138	39	0	1382	0	0	1303	216	123	0		75	0	85	793
BEV100 DM	2020	med	high	Midsize		1325	16855	3068	0	0	648	0	489	0	0	0	58	75	113	85	793
BEV100	2020	med	high	Midsize		1269	16492	3118	0	0	723	0	0	0	0	0	65	0	115	85	793
BEV 200 DM	2020	med	high	Midsize		1411	20365	6473	0	0	753	0	489	0	0	0	67	75	190	85	793

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
BEV 200	2020	med	high	Midsize		1354	19983	6520	0	0	812	0	0	0	0	0	73	0	192	85	793
BEV300 DM	2020	med	high	Midsize		1527	24138	10189	0	0	810	0	489	0	0	0	73	75	300	85	793
BEV300	2020	med	high	Midsize		1472	23853	10326	0	0	877	0	0	0	0	0	79	0	304	85	793
EREV PHEV30	2020	med	high	Midsize	CI	1595	20424	2211	0	2134	670	614	1219	193	151	0	60	75	74	85	793
EREV PHEV30	2020	med	high	Midsize	CNG	1562	19836	2170	0	911	658	603	1219	1290	150	0	59	75	73	85	793
EREV PHEV30	2020	med	high	Midsize	E85	1506	18666	2101	0	927	638	585	1219	216	102	0	57	75	72	85	793
EREV PHEV30	2020	med	high	Midsize	SI	1504	18636	2099	0	902	636	584	1219	216	102	0	57	75	72	85	793
EREV PHEV40	2020	med	high	Midsize	CI	1623	20686	2445	0	2138	680	623	1219	193	151	0	61	75	100	85	793
EREV PHEV40	2020	med	high	Midsize	CNG	1591	20088	2387	0	916	671	613	1219	1296	151	0	60	75	98	85	793
EREV PHEV40	2020	med	high	Midsize	E85	1533	18951	2362	0	931	648	593	1219	216	102	0	58	75	97	85	793
EREV PHEV40	2020	med	high	Midsize	SI	1531	18920	2359	0	906	646	592	1219	216	102	0	58	75	97	85	793
FC Series HEV	2020	med	high	Midsize		1437	18849	751	2866	0	744	0	489	1460	0	109	67	75	11	85	793
FC Series PHEV10	2020	med	high	Midsize		1458	19228	1025	2879	0	772	0	489	1425	0	112	69	75	30	85	793
FC Series PHEV20	2020	med	high	Midsize		1490	19877	1643	2900	0	772	0	489	1435	0	114	69	75	59	85	793
FC Series PHEV30	2020	med	high	Midsize		1520	20330	1973	2922	0	768	0	489	1528	0	116	69	75	81	85	793
FC Series PHEV40	2020	med	high	Midsize		1554	21082	2679	2943	0	768	0	489	1553	0	119	69	75	110	85	793
Split PHEV10	2020	med	high	Midsize	CI	1529	18799	1143	0	2147	459	537	938	193	152	0	41	75	33	85	793
Split PHEV10	2020	med	high	Midsize	CNG	1493	18187	1079	0	932	505	370	938	1382	152	0	45	75	32	85	793
Split PHEV10	2020	med	high	Midsize	E85	1431	16929	1046	0	941	458	356	938	216	104	0	41	75	31	85	793
Split PHEV10	2020	med	high	Midsize	SI	1429	16904	1047	0	916	457	355	938	216	104	0	41	75	31	85	793
Split PHEV20	2020	med	high	Midsize	CI	1561	19478	1816	0	2149	459	540	938	193	152	0	41	75	65	85	793
Split PHEV20	2020	med	high	Midsize	CNG	1524	18835	1712	0	937	505	377	938	1382	153	0	45	75	61	85	793
Split PHEV20	2020	med	high	Midsize	E85	1459	17548	1659	0	943	458	358	938	216	104	0	41	75	59	85	793
Split PHEV20	2020	med	high	Midsize	SI	1457	17522	1659	0	918	457	357	938	216	104	0	41	75	59	85	793
Split HEV	2020	med	high	Midsize	CI	1502	18172	676	0	2138	432	521	938	193	151	0	39	75	10	85	793
Split HEV	2020	med	high	Midsize	CNG	1470	17576	601	0	927	511	365	938	1355	152	0	46	75	9	85	793
Split HEV	2020	med	high	Midsize	E85	1407	16359	601	0	934	453	347	938	216	103	0	41	75	9	85	793
Split HEV	2020	med	high	Midsize	SI	1402	16309	601	0	905	438	342	938	216	102	0	39	75	9	85	793

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Conventional	2025	high	high	Midsize	CI	1323	17312	39	0	2558	0	0	1258	183	155	0		75	0	85	685
Conventional	2025	high	high	Midsize	CNG	1312	17751	39	0	1853	0	0	1159	1835	158	0		75	0	85	685
Conventional	2025	high	high	Midsize	E85	1247	16108	39	0	1862	0	0	1142	206	112	0		75	0	85	685
Conventional	2025	high	high	Midsize	SI	1251	16169	39	0	1905	0	0	1144	206	119	0		75	0	85	685
BEV100 DM	2025	high	high	Midsize		1146	16039	1775	0	0	487	0	465	0	0	0	43	75	57	85	685
BEV100	2025	high	high	Midsize		1087	15663	1811	0	0	539	0	0	0	0	0	48	0	58	85	685
BEV 200 DM	2025	high	high	Midsize		1195	18028	3691	0	0	559	0	465	0	0	0	50	75	99	85	685
BEV 200	2025	high	high	Midsize		1133	17620	3721	0	0	587	0	0	0	0	0	52	0	100	85	685
BEV300 DM	2025	high	high	Midsize		1251	20042	5682	0	0	582	0	465	0	0	0	52	75	153	85	685
BEV300	2025	high	high	Midsize		1191	19685	5752	0	0	621	0	0	0	0	0	55	0	155	85	685
EREV PHEV30	2025	high	high	Midsize	CI	1426	20557	1776	0	2486	510	466	1159	183	147	0	46	75	44	85	685
EREV PHEV30	2025	high	high	Midsize	CNG	1376	20127	1718	0	1745	496	452	1159	945	146	0	44	75	43	85	685
EREV PHEV30	2025	high	high	Midsize	E85	1335	19345	1686	0	1762	482	441	1159	206	96	0	43	75	42	85	685
EREV PHEV30	2025	high	high	Midsize	SI	1333	19316	1683	0	1739	481	440	1159	206	96	0	43	75	42	85	685
EREV PHEV40	2025	high	high	Midsize	CI	1441	20613	1815	0	2489	516	471	1159	183	147	0	46	75	59	85	685
EREV PHEV40	2025	high	high	Midsize	CNG	1392	20185	1759	0	1748	501	457	1159	947	146	0	45	75	57	85	685
EREV PHEV40	2025	high	high	Midsize	E85	1351	19385	1712	0	1765	487	446	1159	206	96	0	43	75	57	85	685
EREV PHEV40	2025	high	high	Midsize	SI	1349	19357	1710	0	1741	486	445	1159	206	96	0	43	75	57	85	685
FC Series HEV	2025	high	high	Midsize		1257	18017	574	2105	0	583	0	465	1083	0	90	52	75	7	85	685
FC Series PHEV10	2025	high	high	Midsize		1270	18306	762	2112	0	605	0	465	1060	0	91	54	75	18	85	685
FC Series PHEV20	2025	high	high	Midsize		1289	18503	944	2123	0	605	0	465	1064	0	92	54	75	36	85	685
FC Series PHEV30	2025	high	high	Midsize		1306	19141	1501	2134	0	602	0	465	1126	0	93	54	75	48	85	685
FC Series PHEV40	2025	high	high	Midsize		1323	19189	1527	2143	0	602	0	465	1139	0	94	54	75	64	85	685
Split PHEV10	2025	high	high	Midsize	CI	1387	19127	780	0	2503	368	419	892	183	149	0	33	75	21	85	685
Split PHEV10	2025	high	high	Midsize	CNG	1334	18706	744	0	1767	402	284	892	1006	148	0	36	75	19	85	685
Split PHEV10	2025	high	high	Midsize	E85	1291	17841	717	0	1780	365	275	892	206	99	0	33	75	19	85	685
Split PHEV10	2025	high	high	Midsize	SI	1288	17816	717	0	1757	364	274	892	206	99	0	33	75	19	85	685
Split PHEV20	2025	high	high	Midsize	CI	1407	19414	1056	0	2507	368	424	892	183	149	0	33	75	40	85	685

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Split PHEV20	2025	high	high	Midsize	CNG	1352	18939	979	0	1767	402	284	892	1004	148	0	36	75	37	85	685
Split PHEV20	2025	high	high	Midsize	E85	1308	18081	956	0	1780	365	275	892	206	99	0	33	75	36	85	685
Split PHEV20	2025	high	high	Midsize	SI	1305	18056	956	0	1757	364	274	892	206	99	0	33	75	36	85	685
Split HEV	2025	high	high	Midsize	CI	1368	18764	574	0	2494	340	403	892	183	148	0	30	75	7	85	685
Split HEV	2025	high	high	Midsize	CNG	1322	18365	502	0	1761	425	277	892	993	148	0	38	75	6	85	685
Split HEV	2025	high	high	Midsize	E85	1274	17565	574	0	1771	350	265	892	206	97	0	31	75	7	85	685
Split HEV	2025	high	high	Midsize	SI	1271	17467	502	0	1748	346	265	892	206	97	0	31	75	6	85	685
Conventional	2025	low	high	Midsize	CI	1543	15528	39	0	2118	0	0	1282	183	161	0		75	0	85	899
Conventional	2025	low	high	Midsize	CNG	1558	16335	39	0	1437	0	0	1167	2219	164	0		75	0	85	899
Conventional	2025	low	high	Midsize	E85	1469	14527	39	0	1666	0	0	1148	206	121	0		75	0	85	899
Conventional	2025	low	high	Midsize	SI	1474	14574	39	0	1693	0	0	1150	206	129	0		75	0	85	899
BEV100 DM	2025	low	high	Midsize		1427	15287	2309	0	0	608	0	465	0	0	0	58	75	109	85	899
BEV100	2025	low	high	Midsize		1371	14938	2350	0	0	682	0	0	0	0	0	65	0	111	85	899
BEV 200 DM	2025	low	high	Midsize		1503	17918	4849	0	0	698	0	465	0	0	0	67	75	176	85	899
BEV 200	2025	low	high	Midsize		1444	17556	4894	0	0	756	0	0	0	0	0	72	0	177	85	899
BEV300 DM	2025	low	high	Midsize		1606	20698	7583	0	0	744	0	465	0	0	0	71	75	275	85	899
BEV300	2025	low	high	Midsize		1550	20389	7675	0	0	808	0	0	0	0	0	77	0	278	85	899
EREV PHEV30	2025	low	high	Midsize	CI	1716	19539	2299	0	2053	638	583	1159	183	153	0	61	75	85	85	899
EREV PHEV30	2025	low	high	Midsize	CNG	1700	19688	2278	0	1339	636	578	1159	1464	153	0	61	75	85	85	899
EREV PHEV30	2025	low	high	Midsize	E85	1628	18297	2186	0	1351	609	557	1159	206	106	0	58	75	83	85	899
EREV PHEV30	2025	low	high	Midsize	SI	1626	18268	2183	0	1328	607	556	1159	206	106	0	58	75	83	85	899
EREV PHEV40	2025	low	high	Midsize	CI	1748	19650	2379	0	2059	648	594	1159	183	154	0	62	75	114	85	899
EREV PHEV40	2025	low	high	Midsize	CNG	1732	19809	2360	0	1345	647	589	1159	1472	154	0	62	75	113	85	899
EREV PHEV40	2025	low	high	Midsize	E85	1658	18399	2258	0	1357	621	567	1159	206	107	0	59	75	110	85	899
EREV PHEV40	2025	low	high	Midsize	SI	1655	18367	2254	0	1333	619	566	1159	206	106	0	59	75	110	85	899
FC Series HEV	2025	low	high	Midsize		1558	17405	717	2288	0	693	0	465	1444	0	118	66	75	12	85	899
FC Series PHEV10	2025	low	high	Midsize		1584	17749	962	2300	0	717	0	465	1411	0	123	68	75	34	85	899
FC Series PHEV20	2025	low	high	Midsize		1619	18301	1484	2317	0	717	0	465	1423	0	125	68	75	66	85	899

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
FC Series PHEV30	2025	low	high	Midsize		1653	18873	1936	2335	0	714	0	465	1518	0	127	68	75	91	85	899
FC Series PHEV40	2025	low	high	Midsize		1690	19033	2053	2353	0	714	0	465	1543	0	130	68	75	123	85	899
Split PHEV10	2025	low	high	Midsize	CI	1642	17726	1040	0	2061	430	501	892	183	154	0	41	75	38	85	899
Split PHEV10	2025	low	high	Midsize	CNG	1612	17683	986	0	1355	474	349	892	1397	155	0	45	75	36	85	899
Split PHEV10	2025	low	high	Midsize	E85	1542	16398	954	0	1361	431	332	892	206	107	0	41	75	34	85	899
Split PHEV10	2025	low	high	Midsize	SI	1540	16373	953	0	1337	431	332	892	206	107	0	41	75	34	85	899
Split PHEV20	2025	low	high	Midsize	CI	1678	18347	1647	0	2065	430	507	892	183	155	0	41	75	73	85	899
Split PHEV20	2025	low	high	Midsize	CNG	1646	18278	1561	0	1361	474	355	892	1402	155	0	45	75	69	85	899
Split PHEV20	2025	low	high	Midsize	E85	1576	16966	1511	0	1365	431	337	892	206	108	0	41	75	67	85	899
Split PHEV20	2025	low	high	Midsize	SI	1574	16941	1511	0	1341	431	337	892	206	108	0	41	75	67	85	899
Split HEV	2025	low	high	Midsize	CI	1609	17188	645	0	2053	409	488	892	183	153	0	39	75	10	85	899
Split HEV	2025	low	high	Midsize	CNG	1585	17223	645	0	1350	485	343	892	1376	154	0	46	75	10	85	899
Split HEV	2025	low	high	Midsize	E85	1515	15968	645	0	1354	421	325	892	206	106	0	40	75	10	85	899
Split HEV	2025	low	high	Midsize	SI	1511	15924	645	0	1326	414	320	892	206	105	0	39	75	11	85	899
Conventional	2025	med	high	Midsize	CI	1378	16833	39	0	2323	0	0	1356	183	156	0		75	0	85	739
Conventional	2025	med	high	Midsize	CNG	1380	17345	39	0	1499	0	0	1254	2037	159	0		75	0	85	739
Conventional	2025	med	high	Midsize	E85	1302	15719	39	0	1729	0	0	1236	206	114	0		75	0	85	739
Conventional	2025	med	high	Midsize	SI	1306	15774	39	0	1769	0	0	1236	206	121	0		75	0	85	739
BEV100 DM	2025	med	high	Midsize		1225	15936	1986	0	0	525	0	465	0	0	0	48	75	77	85	739
BEV100	2025	med	high	Midsize		1167	15558	2014	0	0	584	0	0	0	0	0	54	0	78	85	739
BEV 200 DM	2025	med	high	Midsize		1284	18180	4151	0	0	604	0	465	0	0	0	56	75	128	85	739
BEV 200	2025	med	high	Midsize		1223	17764	4165	0	0	639	0	0	0	0	0	59	0	129	85	739
BEV300 DM	2025	med	high	Midsize		1358	20497	6436	0	0	636	0	465	0	0	0	59	75	199	85	739
BEV300	2025	med	high	Midsize		1298	20115	6473	0	0	681	0	0	0	0	0	63	0	200	85	739
EREV PHEV30	2025	med	high	Midsize	CI	1508	20251	1949	0	2257	554	506	1159	183	149	0	51	75	60	85	739
EREV PHEV30	2025	med	high	Midsize	CNG	1469	19872	1902	0	1400	542	495	1159	1104	148	0	50	75	59	85	739
EREV PHEV30	2025	med	high	Midsize	E85	1417	18894	1843	0	1416	526	479	1159	206	99	0	48	75	58	85	739
EREV PHEV30	2025	med	high	Midsize	SI	1415	18866	1841	0	1392	524	479	1159	206	99	0	48	75	58	85	739

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
EREV PHEV40	2025	med	high	Midsize	CI	1529	20313	1991	0	2261	562	512	1159	183	149	0	52	75	80	85	739
EREV PHEV40	2025	med	high	Midsize	CNG	1491	19951	1947	0	1403	563	500	1159	1108	149	0	52	75	78	85	739
EREV PHEV40	2025	med	high	Midsize	E85	1438	18955	1888	0	1418	532	485	1159	206	100	0	49	75	76	85	739
EREV PHEV40	2025	med	high	Midsize	SI	1435	18925	1884	0	1395	531	484	1159	206	99	0	49	75	76	85	739
FC Series HEV	2025	med	high	Midsize		1351	17986	645	2173	0	619	0	465	1231	0	103	57	75	9	85	739
FC Series PHEV10	2025	med	high	Midsize		1370	18267	826	2183	0	642	0	465	1202	0	106	59	75	25	85	739
FC Series PHEV20	2025	med	high	Midsize		1396	18645	1183	2196	0	642	0	465	1210	0	108	59	75	49	85	739
FC Series PHEV30	2025	med	high	Midsize		1418	19205	1647	2210	0	638	0	465	1285	0	109	59	75	65	85	739
FC Series PHEV40	2025	med	high	Midsize		1444	19304	1713	2223	0	638	0	465	1304	0	111	59	75	87	85	739
Split PHEV10	2025	med	high	Midsize	CI	1456	18658	837	0	2271	386	445	892	183	150	0	36	75	28	85	739
Split PHEV10	2025	med	high	Midsize	CNG	1411	18253	803	0	1418	424	303	892	1147	150	0	39	75	26	85	739
Split PHEV10	2025	med	high	Midsize	E85	1356	17237	770	0	1430	384	293	892	206	101	0	35	75	25	85	739
Split PHEV10	2025	med	high	Midsize	SI	1354	17212	770	0	1406	384	293	892	206	101	0	35	75	25	85	739
Split PHEV20	2025	med	high	Midsize	CI	1483	19146	1296	0	2279	386	459	892	183	151	0	36	75	53	85	739
Split PHEV20	2025	med	high	Midsize	CNG	1439	18715	1233	0	1431	424	317	892	1146	152	0	39	75	51	85	739
Split PHEV20	2025	med	high	Midsize	E85	1383	17682	1195	0	1438	384	302	892	206	103	0	35	75	49	85	739
Split PHEV20	2025	med	high	Midsize	SI	1381	17657	1194	0	1415	384	302	892	206	103	0	35	75	49	85	739
Split HEV	2025	med	high	Midsize	CI	1432	18245	574	0	2262	364	430	892	183	149	0	34	75	8	85	739
Split HEV	2025	med	high	Midsize	CNG	1389	17876	574	0	1413	413	298	892	1117	150	0	38	75	8	85	739
Split HEV	2025	med	high	Midsize	E85	1336	16903	574	0	1420	368	282	892	206	100	0	34	75	8	85	739
Split HEV	2025	med	high	Midsize	SI	1334	16878	574	0	1396	367	282	892	206	100	0	34	75	8	85	739
Conventional	2030	high	high	Midsize	CI	1253	17537	0	0	2414	30	0	1236	174	153	0	3	75	0	85	617
Conventional	2030	high	high	Midsize	CNG	1228	17032	0	0	1744	30	0	1145	814	156	0	3	75	0	85	617
Conventional	2030	high	high	Midsize	E85	1176	16402	0	0	1753	30	0	1128	196	109	0	3	75	0	85	617
Conventional	2030	high	high	Midsize	SI	1179	16453	0	0	1789	30	0	1129	196	115	0	3	75	0	85	617
BEV100 DM	2030	high	high	Midsize		1064	16079	1536	0	0	386	0	442	0	0	0	36	75	50	85	617
BEV100	2030	high	high	Midsize		1003	15690	1549	0	0	426	0	0	0	0	0	39	0	51	85	617
BEV 200 DM	2030	high	high	Midsize		1104	17737	3141	0	0	439	0	442	0	0	0	41	75	85	85	617

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
BEV 200	2030	high	high	Midsize		1042	17345	3168	0	0	462	0	0	0	0	0	43	0	86	85	617
BEV300 DM	2030	high	high	Midsize		1151	19436	4822	0	0	456	0	442	0	0	0	42	75	131	85	617
BEV300	2030	high	high	Midsize		1091	19081	4879	0	0	487	0	0	0	0	0	45	0	133	85	617
EREV PHEV30	2030	high	high	Midsize	CI	1329	20263	1533	0	2347	406	369	1102	174	145	0	38	75	33	85	617
EREV PHEV30	2030	high	high	Midsize	CNG	1270	19333	1468	0	1640	395	354	1102	384	144	0	37	75	32	85	617
EREV PHEV30	2030	high	high	Midsize	E85	1239	19109	1435	0	1658	382	347	1102	196	93	0	35	75	32	85	617
EREV PHEV30	2030	high	high	Midsize	SI	1237	19103	1433	0	1656	382	346	1102	196	93	0	35	75	32	85	617
EREV PHEV40	2030	high	high	Midsize	CI	1340	20301	1562	0	2348	409	372	1102	174	145	0	38	75	44	85	617
EREV PHEV40	2030	high	high	Midsize	CNG	1280	19369	1497	0	1642	394	357	1102	385	144	0	36	75	43	85	617
EREV PHEV40	2030	high	high	Midsize	E85	1250	19145	1463	0	1660	385	350	1102	196	93	0	36	75	42	85	617
EREV PHEV40	2030	high	high	Midsize	SI	1248	19140	1461	0	1658	384	349	1102	196	93	0	36	75	42	85	617
FC Series HEV	2030	high	high	Midsize		1153	17607	546	1720	0	461	0	442	822	0	79	43	75	6	85	617
FC Series PHEV10	2030	high	high	Midsize		1161	17816	660	1724	0	478	0	442	806	0	79	44	75	14	85	617
FC Series PHEV20	2030	high	high	Midsize		1175	17881	715	1731	0	478	0	442	810	0	80	44	75	27	85	617
FC Series PHEV30	2030	high	high	Midsize		1189	18503	1270	1740	0	475	0	442	861	0	81	44	75	37	85	617
FC Series PHEV40	2030	high	high	Midsize		1201	18535	1289	1746	0	475	0	442	867	0	82	44	75	48	85	617
Split PHEV10	2030	high	high	Midsize	CI	1301	19035	681	0	2363	298	333	848	174	147	0	28	75	16	85	617
Split PHEV10	2030	high	high	Midsize	CNG	1238	18098	643	0	1661	324	224	848	407	146	0	30	75	15	85	617
Split PHEV10	2030	high	high	Midsize	E85	1205	17840	624	0	1675	294	217	848	196	96	0	27	75	15	85	617
Split PHEV10	2030	high	high	Midsize	SI	1202	17837	623	0	1673	293	217	848	196	95	0	27	75	15	85	617
Split PHEV20	2030	high	high	Midsize	CI	1315	19153	793	0	2358	320	326	848	174	146	0	30	75	30	85	617
Split PHEV20	2030	high	high	Midsize	CNG	1251	18206	752	0	1661	324	224	848	407	146	0	30	75	28	85	617
Split PHEV20	2030	high	high	Midsize	E85	1219	17956	731	0	1671	311	214	848	196	95	0	29	75	28	85	617
Split PHEV20	2030	high	high	Midsize	SI	1217	17951	731	0	1669	309	213	848	196	95	0	29	75	28	85	617
Split HEV	2030	high	high	Midsize	CI	1285	18689	478	0	2354	277	319	848	174	145	0	26	75	5	85	617
Split HEV	2030	high	high	Midsize	CNG	1225	17804	478	0	1653	311	216	848	401	145	0	29	75	5	85	617
Split HEV	2030	high	high	Midsize	E85	1192	17574	478	0	1667	282	209	848	196	94	0	26	75	6	85	617
Split HEV	2030	high	high	Midsize	SI	1190	17571	478	0	1665	282	209	848	196	94	0	26	75	6	85	617

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Conventional	2030	low	high	Midsize	CI	1489	15717	39	0	2000	0	0	1320	174	159	0		75	0	85	848
Conventional	2030	low	high	Midsize	CNG	1497	15821	39	0	1797	0	0	1213	994	162	0		75	0	85	848
Conventional	2030	low	high	Midsize	E85	1415	14877	39	0	1670	0	0	1198	196	118	0		75	0	85	848
Conventional	2030	low	high	Midsize	SI	1419	14902	39	0	1685	0	0	1195	196	125	0		75	0	85	848
BEV100 DM	2030	low	high	Midsize		1354	15202	2069	0	0	495	0	442	0	0	0	48	75	97	85	848
BEV100	2030	low	high	Midsize		1297	14855	2105	0	0	553	0	0	0	0	0	54	0	99	85	848
BEV 200 DM	2030	low	high	Midsize		1422	17532	4325	0	0	568	0	442	0	0	0	56	75	157	85	848
BEV 200	2030	low	high	Midsize		1362	17162	4354	0	0	612	0	0	0	0	0	60	0	158	85	848
BEV300 DM	2030	low	high	Midsize		1512	19979	6737	0	0	603	0	442	0	0	0	59	75	244	85	848
BEV300	2030	low	high	Midsize		1455	19662	6814	0	0	651	0	0	0	0	0	64	0	247	85	848
EREV PHEV30	2030	low	high	Midsize	CI	1630	19102	2028	0	1938	520	474	1102	174	152	0	51	75	71	85	848
EREV PHEV30	2030	low	high	Midsize	CNG	1604	18912	1995	0	1706	514	467	1102	625	151	0	50	75	70	85	848
EREV PHEV30	2030	low	high	Midsize	E85	1542	18385	1924	0	1719	496	451	1102	196	103	0	49	75	69	85	848
EREV PHEV30	2030	low	high	Midsize	SI	1539	18358	1921	0	1696	494	450	1102	196	103	0	48	75	69	85	848
EREV PHEV40	2030	low	high	Midsize	CI	1656	19185	2089	0	1942	527	481	1102	174	152	0	52	75	95	85	848
EREV PHEV40	2030	low	high	Midsize	CNG	1631	18999	2059	0	1710	522	475	1102	628	152	0	51	75	94	85	848
EREV PHEV40	2030	low	high	Midsize	E85	1567	18454	1972	0	1723	503	458	1102	196	104	0	49	75	92	85	848
EREV PHEV40	2030	low	high	Midsize	SI	1565	18426	1969	0	1700	502	458	1102	196	104	0	49	75	92	85	848
FC Series HEV	2030	low	high	Midsize		1482	16856	683	1900	0	568	0	442	1167	0	113	56	75	11	85	848
FC Series PHEV10	2030	low	high	Midsize		1499	17124	865	1908	0	586	0	442	1138	0	116	57	75	26	85	848
FC Series PHEV20	2030	low	high	Midsize		1526	17503	1226	1919	0	586	0	442	1145	0	118	57	75	51	85	848
FC Series PHEV30	2030	low	high	Midsize		1559	18058	1676	1935	0	585	0	442	1224	0	120	57	75	76	85	848
FC Series PHEV40	2030	low	high	Midsize		1589	18277	1866	1947	0	585	0	442	1241	0	122	57	75	102	85	848
Split PHEV10	2030	low	high	Midsize	CI	1566	17451	861	0	1945	354	407	848	174	152	0	35	75	29	85	848
Split PHEV10	2030	low	high	Midsize	CNG	1528	17141	825	0	1718	390	280	848	584	153	0	38	75	28	85	848
Split PHEV10	2030	low	high	Midsize	E85	1470	16677	792	0	1727	354	269	848	196	105	0	35	75	27	85	848
Split PHEV10	2030	low	high	Midsize	SI	1467	16653	792	0	1704	353	269	848	196	104	0	35	75	27	85	848
Split PHEV20	2030	low	high	Midsize	CI	1594	17961	1367	0	1946	354	409	848	174	153	0	35	75	56	85	848

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Split PHEV20	2030	low	high	Midsize	CNG	1554	17619	1293	0	1722	390	284	848	584	153	0	38	75	53	85	848
Split PHEV20	2030	low	high	Midsize	E85	1496	17147	1256	0	1729	354	272	848	196	105	0	35	75	52	85	848
Split PHEV20	2030	low	high	Midsize	SI	1494	17122	1256	0	1707	353	271	848	196	105	0	35	75	52	85	848
Split HEV	2030	low	high	Midsize	CI	1544	17074	615	0	1938	336	397	848	174	152	0	33	75	10	85	848
Split HEV	2030	low	high	Midsize	CNG	1509	16776	546	0	1715	411	277	848	574	152	0	40	75	9	85	848
Split HEV	2030	low	high	Midsize	E85	1450	16376	615	0	1718	342	261	848	196	103	0	34	75	10	85	848
Split HEV	2030	low	high	Midsize	SI	1447	16352	615	0	1696	341	260	848	196	103	0	33	75	10	85	848
Conventional	2030	med	high	Midsize	CI	1325	16830	0	0	2175	30	0	1257	174	152	0	3	75	0	85	691
Conventional	2030	med	high	Midsize	CNG	1320	16706	0	0	1756	30	0	1185	916	157	0	3	75	0	85	691
Conventional	2030	med	high	Midsize	E85	1251	15837	0	0	1628	30	0	1169	196	111	0	3	75	0	85	691
Conventional	2030	med	high	Midsize	SI	1254	15885	0	0	1663	30	0	1169	196	117	0	3	75	0	85	691
BEV100 DM	2030	med	high	Midsize		1162	15884	1785	0	0	426	0	442	0	0	0	41	75	69	85	691
BEV100	2030	med	high	Midsize		1101	15490	1787	0	0	472	0	0	0	0	0	45	0	69	85	691
BEV 200 DM	2030	med	high	Midsize		1213	17837	3675	0	0	490	0	442	0	0	0	47	75	114	85	691
BEV 200	2030	med	high	Midsize		1150	17425	3678	0	0	516	0	0	0	0	0	49	0	114	85	691
BEV300 DM	2030	med	high	Midsize		1277	19868	5681	0	0	514	0	442	0	0	0	49	75	176	85	691
BEV300	2030	med	high	Midsize		1216	19483	5705	0	0	548	0	0	0	0	0	52	0	177	85	691
EREV PHEV30	2030	med	high	Midsize	CI	1430	19855	1721	0	2133	449	409	1102	174	147	0	43	75	48	85	691
EREV PHEV30	2030	med	high	Midsize	CNG	1383	19256	1668	0	1665	437	397	1102	470	146	0	42	75	48	85	691
EREV PHEV30	2030	med	high	Midsize	E85	1341	18927	1622	0	1681	425	386	1102	196	97	0	40	75	47	85	691
EREV PHEV30	2030	med	high	Midsize	SI	1339	18922	1620	0	1679	424	386	1102	196	97	0	40	75	47	85	691
EREV PHEV40	2030	med	high	Midsize	CI	1447	19912	1763	0	2135	454	413	1102	174	148	0	43	75	64	85	691
EREV PHEV40	2030	med	high	Midsize	CNG	1400	19314	1709	0	1668	443	402	1102	472	147	0	42	75	63	85	691
EREV PHEV40	2030	med	high	Midsize	E85	1357	18979	1662	0	1684	429	391	1102	196	97	0	41	75	62	85	691
EREV PHEV40	2030	med	high	Midsize	SI	1354	18972	1659	0	1682	428	390	1102	196	97	0	41	75	61	85	691
FC Series HEV	2030	med	high	Midsize		1272	17449	615	1795	0	502	0	442	965	0	95	48	75	8	85	691
FC Series PHEV10	2030	med	high	Midsize		1286	17666	736	1802	0	521	0	442	945	0	97	50	75	20	85	691
FC Series PHEV20	2030	med	high	Midsize		1306	17841	897	1811	0	521	0	442	950	0	98	50	75	38	85	691

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
FC Series PHEV30	2030	med	high	Midsize		1324	18460	1436	1821	0	518	0	442	1012	0	99	49	75	52	85	691
FC Series PHEV40	2030	med	high	Midsize		1344	18508	1463	1830	0	518	0	442	1023	0	101	49	75	69	85	691
Split PHEV10	2030	med	high	Midsize	CI	1388	18463	746	0	2146	318	362	848	174	149	0	30	75	22	85	691
Split PHEV10	2030	med	high	Midsize	CNG	1336	17831	711	0	1682	348	245	848	482	148	0	33	75	21	85	691
Split PHEV10	2030	med	high	Midsize	E85	1292	17488	686	0	1695	316	237	848	196	99	0	30	75	20	85	691
Split PHEV10	2030	med	high	Midsize	SI	1290	17485	686	0	1693	315	237	848	196	99	0	30	75	20	85	691
Split PHEV20	2030	med	high	Midsize	CI	1409	18733	1005	0	2149	318	367	848	174	149	0	30	75	42	85	691
Split PHEV20	2030	med	high	Midsize	CNG	1354	18052	933	0	1682	348	245	848	482	148	0	33	75	39	85	691
Split PHEV20	2030	med	high	Midsize	E85	1310	17714	913	0	1695	316	237	848	196	99	0	30	75	38	85	691
Split PHEV20	2030	med	high	Midsize	SI	1308	17712	913	0	1693	315	237	848	196	99	0	30	75	38	85	691
Split HEV	2030	med	high	Midsize	CI	1370	18123	546	0	2137	299	348	848	174	148	0	29	75	7	85	691
Split HEV	2030	med	high	Midsize	CNG	1323	17520	478	0	1677	379	239	848	476	148	0	36	75	6	85	691
Split HEV	2030	med	high	Midsize	E85	1276	17223	546	0	1686	303	228	848	196	97	0	29	75	8	85	691
Split HEV	2030	med	high	Midsize	SI	1274	17221	546	0	1684	302	228	848	196	97	0	29	75	8	85	691
Conventional	2045	high	high	Midsize	CI	1183	17289	0	0	2064	25	0	1048	150	151	0	3	75	0	85	549
Conventional	2045	high	high	Midsize	CNG	1150	16900	0	0	1486	25	0	973	738	154	0	3	75	0	85	549
Conventional	2045	high	high	Midsize	E85	1104	16316	0	0	1491	25	0	958	168	106	0	3	75	0	85	549
Conventional	2045	high	high	Midsize	SI	1108	16362	0	0	1523	25	0	961	168	112	0	3	75	0	85	549
BEV100 DM	2045	high	high	Midsize		987	15977	1254	0	0	299	0	380	0	0	0	30	75	47	85	549
BEV100	2045	high	high	Midsize		926	15639	1267	0	0	328	0	0	0	0	0	33	0	48	85	549
BEV 200 DM	2045	high	high	Midsize		1024	17334	2570	0	0	341	0	380	0	0	0	34	75	80	85	549
BEV 200	2045	high	high	Midsize		962	16986	2586	0	0	357	0	0	0	0	0	36	0	81	85	549
BEV300 DM	2045	high	high	Midsize		1068	18720	3943	0	0	354	0	380	0	0	0	35	75	123	85	549
BEV300	2045	high	high	Midsize		1007	18401	3982	0	0	376	0	0	0	0	0	38	0	124	85	549
EREV PHEV30	2045	high	high	Midsize	CI	1241	19679	1409	0	2006	317	287	948	150	143	0	32	75	26	85	549
EREV PHEV30	2045	high	high	Midsize	CNG	1173	18851	1339	0	1397	302	273	948	318	142	0	30	75	25	85	549
EREV PHEV30	2045	high	high	Midsize	E85	1151	18682	1314	0	1413	297	268	948	168	90	0	30	75	25	85	549
EREV PHEV30	2045	high	high	Midsize	SI	1148	18675	1311	0	1412	296	267	948	168	90	0	30	75	25	85	549

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
EREV PHEV40	2045	high	high	Midsize	CI	1249	19706	1430	0	2007	320	288	948	150	143	0	32	75	34	85	549
EREV PHEV40	2045	high	high	Midsize	CNG	1181	18877	1358	0	1398	304	274	948	320	142	0	30	75	33	85	549
EREV PHEV40	2045	high	high	Midsize	E85	1159	18708	1336	0	1414	299	270	948	168	90	0	30	75	33	85	549
EREV PHEV40	2045	high	high	Midsize	SI	1156	18701	1332	0	1413	298	269	948	168	90	0	30	75	33	85	549
FC Series HEV	2045	high	high	Midsize		1050	17391	430	1555	0	353	0	380	719	0	61	35	75	5	85	549
FC Series PHEV10	2045	high	high	Midsize		1056	17645	604	1558	0	365	0	380	705	0	61	36	75	11	85	549
FC Series PHEV20	2045	high	high	Midsize		1067	17657	608	1563	0	365	0	380	707	0	62	36	75	21	85	549
FC Series PHEV30	2045	high	high	Midsize		1078	18258	1145	1570	0	362	0	380	756	0	63	36	75	28	85	549
FC Series PHEV40	2045	high	high	Midsize		1087	18280	1159	1574	0	362	0	380	762	0	63	36	75	37	85	549
Split PHEV10	2045	high	high	Midsize	CI	1217	18588	633	0	2019	234	259	730	150	145	0	23	75	12	85	549
Split PHEV10	2045	high	high	Midsize	CNG	1149	17773	593	0	1414	253	173	730	339	144	0	25	75	12	85	549
Split PHEV10	2045	high	high	Midsize	E85	1122	17565	577	0	1421	240	162	730	168	92	0	24	75	11	85	549
Split PHEV10	2045	high	high	Midsize	SI	1119	17561	576	0	1419	239	162	730	168	92	0	24	75	11	85	549
Split PHEV20	2045	high	high	Midsize	CI	1230	18605	638	0	2015	260	252	730	150	144	0	26	75	24	85	549
Split PHEV20	2045	high	high	Midsize	CNG	1159	17777	598	0	1414	253	173	730	338	144	0	25	75	22	85	549
Split PHEV20	2045	high	high	Midsize	E85	1133	17578	582	0	1423	243	164	730	168	92	0	24	75	22	85	549
Split PHEV20	2045	high	high	Midsize	SI	1130	17574	582	0	1421	242	164	730	168	92	0	24	75	22	85	549
Split HEV	2045	high	high	Midsize	CI	1207	18264	430	0	2011	218	248	730	150	144	0	22	75	5	85	549
Split HEV	2045	high	high	Midsize	CNG	1142	17461	369	0	1407	266	166	730	334	143	0	27	75	4	85	549
Split HEV	2045	high	high	Midsize	E85	1113	17313	430	0	1420	218	161	730	168	91	0	22	75	5	85	549
Split HEV	2045	high	high	Midsize	SI	1109	17306	430	0	1418	213	161	730	168	91	0	21	75	5	85	549
Conventional	2045	low	high	Midsize	CI	1434	15660	0	0	1976	25	0	1118	150	155	0	3	75	0	85	797
Conventional	2045	low	high	Midsize	CNG	1431	15567	0	0	1529	25	0	1047	906	159	0	3	75	0	85	797
Conventional	2045	low	high	Midsize	E85	1361	14704	0	0	1420	25	0	1034	168	115	0	3	75	0	85	797
Conventional	2045	low	high	Midsize	SI	1364	14745	0	0	1451	25	0	1033	168	121	0	3	75	0	85	797
BEV100 DM	2045	low	high	Midsize		1279	14904	1722	0	0	390	0	380	0	0	0	41	75	80	85	797
BEV100	2045	low	high	Midsize		1219	14576	1730	0	0	434	0	0	0	0	0	46	0	80	85	797
BEV 200 DM	2045	low	high	Midsize		1331	16773	3535	0	0	447	0	380	0	0	0	47	75	126	85	797

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
BEV 200	2045	low	high	Midsize		1270	16430	3546	0	0	472	0	0	0	0	0	50	0	127	85	797
BEV300 DM	2045	low	high	Midsize		1402	18723	5463	0	0	469	0	380	0	0	0	49	75	195	85	797
BEV300	2045	low	high	Midsize		1343	18423	5509	0	0	502	0	0	0	0	0	53	0	197	85	797
EREV PHEV30	2045	low	high	Midsize	CI	1550	18709	1903	0	1941	413	377	948	150	150	0	43	75	58	85	797
EREV PHEV30	2045	low	high	Midsize	CNG	1512	18230	1858	0	1455	405	368	948	528	149	0	43	75	58	85	797
EREV PHEV30	2045	low	high	Midsize	E85	1463	17804	1804	0	1467	393	358	948	168	101	0	41	75	57	85	797
EREV PHEV30	2045	low	high	Midsize	SI	1461	17798	1802	0	1466	392	358	948	168	101	0	41	75	57	85	797
EREV PHEV40	2045	low	high	Midsize	CI	1573	18762	1940	0	1944	419	382	948	150	151	0	44	75	79	85	797
EREV PHEV40	2045	low	high	Midsize	CNG	1533	18285	1897	0	1458	409	373	948	530	150	0	43	75	77	85	797
EREV PHEV40	2045	low	high	Midsize	E85	1484	17854	1842	0	1470	396	363	948	168	102	0	42	75	76	85	797
EREV PHEV40	2045	low	high	Midsize	SI	1480	17850	1840	0	1469	397	362	948	168	101	0	42	75	75	85	797
FC Series HEV	2045	low	high	Midsize		1399	16476	553	1737	0	454	0	380	1030	0	106	48	75	8	85	797
FC Series PHEV10	2045	low	high	Midsize		1415	16822	822	1744	0	468	0	380	1006	0	108	49	75	23	85	797
FC Series PHEV20	2045	low	high	Midsize		1440	16917	903	1754	0	468	0	380	1011	0	110	49	75	45	85	797
FC Series PHEV30	2045	low	high	Midsize		1463	17675	1574	1765	0	466	0	380	1079	0	111	49	75	62	85	797
FC Series PHEV40	2045	low	high	Midsize		1488	17759	1635	1774	0	466	0	380	1092	0	113	49	75	84	85	797
Split PHEV10	2045	low	high	Midsize	CI	1500	17219	809	0	1948	285	325	730	150	151	0	30	75	26	85	797
Split PHEV10	2045	low	high	Midsize	CNG	1447	16621	773	0	1464	313	221	730	458	151	0	33	75	24	85	797
Split PHEV10	2045	low	high	Midsize	E85	1405	16277	748	0	1475	284	214	730	168	102	0	30	75	24	85	797
Split PHEV10	2045	low	high	Midsize	SI	1402	16274	748	0	1473	284	214	730	168	102	0	30	75	24	85	797
Split PHEV20	2045	low	high	Midsize	CI	1524	17419	1009	0	1948	285	325	730	150	151	0	30	75	50	85	797
Split PHEV20	2045	low	high	Midsize	CNG	1470	16802	950	0	1466	313	223	730	457	151	0	33	75	47	85	797
Split PHEV20	2045	low	high	Midsize	E85	1428	16462	931	0	1475	284	215	730	168	103	0	30	75	46	85	797
Split PHEV20	2045	low	high	Midsize	SI	1425	16459	930	0	1474	284	214	730	168	102	0	30	75	46	85	797
Split HEV	2045	low	high	Midsize	CI	1478	16786	492	0	1941	271	315	730	150	150	0	29	75	7	85	797
Split HEV	2045	low	high	Midsize	CNG	1428	16245	492	0	1460	315	217	730	451	150	0	33	75	7	85	797
Split HEV	2045	low	high	Midsize	E85	1385	15922	492	0	1469	278	209	730	168	101	0	29	75	7	85	797
Split HEV	2045	low	high	Midsize	SI	1384	15911	492	0	1466	274	207	730	168	101	0	29	75	8	85	797

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Conventional	2045	med	high	Midsize	CI	1267	16802	0	0	2082	25	0	1070	150	153	0	3	75	0	85	631
Conventional	2045	med	high	Midsize	CNG	1244	16455	0	0	1507	25	0	989	791	156	0	3	75	0	85	631
Conventional	2045	med	high	Midsize	E85	1190	15705	0	0	1397	25	0	975	168	110	0	3	75	0	85	631
Conventional	2045	med	high	Midsize	SI	1195	15749	0	0	1428	25	0	976	168	117	0	3	75	0	85	631
BEV100 DM	2045	med	high	Midsize		1087	15678	1462	0	0	333	0	380	0	0	0	34	75	61	85	631
BEV100	2045	med	high	Midsize		1026	15336	1466	0	0	368	0	0	0	0	0	38	0	61	85	631
BEV 200 DM	2045	med	high	Midsize		1131	17265	3003	0	0	380	0	380	0	0	0	39	75	100	85	631
BEV 200	2045	med	high	Midsize		1068	16901	2999	0	0	400	0	0	0	0	0	41	0	100	85	631
BEV300 DM	2045	med	high	Midsize		1187	18907	4625	0	0	399	0	380	0	0	0	41	75	154	85	631
BEV300	2045	med	high	Midsize		1125	18565	4639	0	0	424	0	0	0	0	0	43	0	155	85	631
EREV PHEV30	2045	med	high	Midsize	CI	1346	19435	1597	0	2026	353	321	948	150	146	0	36	75	38	85	631
EREV PHEV30	2045	med	high	Midsize	CNG	1290	18692	1535	0	1419	341	309	948	397	145	0	35	75	37	85	631
EREV PHEV30	2045	med	high	Midsize	E85	1256	18425	1498	0	1434	333	303	948	168	94	0	34	75	36	85	631
EREV PHEV30	2045	med	high	Midsize	SI	1253	18418	1495	0	1433	332	302	948	168	94	0	34	75	36	85	631
EREV PHEV40	2045	med	high	Midsize	CI	1358	19475	1629	0	2028	356	324	948	150	146	0	36	75	50	85	631
EREV PHEV40	2045	med	high	Midsize	CNG	1302	18733	1567	0	1421	344	312	948	398	145	0	35	75	49	85	631
EREV PHEV40	2045	med	high	Midsize	E85	1269	18466	1530	0	1436	336	306	948	168	95	0	34	75	48	85	631
EREV PHEV40	2045	med	high	Midsize	SI	1266	18460	1527	0	1434	335	305	948	168	95	0	34	75	48	85	631
FC Series HEV	2045	med	high	Midsize		1174	17162	492	1631	0	392	0	380	855	0	79	40	75	6	85	631
FC Series PHEV10	2045	med	high	Midsize		1185	17433	683	1636	0	406	0	380	836	0	80	42	75	16	85	631
FC Series PHEV20	2045	med	high	Midsize		1201	17450	690	1643	0	406	0	380	840	0	81	42	75	30	85	631
FC Series PHEV30	2045	med	high	Midsize		1214	18152	1319	1650	0	403	0	380	897	0	82	41	75	40	85	631
FC Series PHEV40	2045	med	high	Midsize		1229	18186	1338	1657	0	403	0	380	905	0	83	41	75	53	85	631
Split PHEV10	2045	med	high	Midsize	CI	1313	18192	699	0	2037	253	284	730	150	147	0	26	75	18	85	631
Split PHEV10	2045	med	high	Midsize	CNG	1253	17430	661	0	1434	276	191	730	399	147	0	28	75	17	85	631
Split PHEV10	2045	med	high	Midsize	E85	1218	17156	641	0	1445	250	186	730	168	96	0	26	75	16	85	631
Split PHEV10	2045	med	high	Midsize	SI	1215	17153	641	0	1443	249	185	730	168	96	0	26	75	16	85	631
Split PHEV20	2045	med	high	Midsize	CI	1331	18228	724	0	2034	275	280	730	150	147	0	28	75	34	85	631

Vehicle Powertrain: {string}	Vehicle Year: {years}	Uncertainty Case: {string}	Cost Uncertainty	Vehicle Class: {string}	Engine Fuel Type: {string}	Vehicle Test Weight: {Kg}	Vehicle Manufacturing Cost (2010$)	Battery Cost (2014$)	Fuel Cell Cost (2010 $)	Engine Total Cost : {$}	Motor1 Cost : {$}	Motor2 Cost : {$}	Transmission Cost : {$}	Fuel Tank Cost : {$}	Engine Component Weight: {Kg}	Fuel Cell Component Weight: {Kg}	Motor Component Weight: {Kg}	GB Component Weight: {Kg}	Energy Storage Component Weight: {Kg}	Wheels Component Weight: {Kg}	Glider Component Weight: {Kg}
Split PHEV20	2045	med	high	Midsize	CNG	1268	17449	681	0	1434	276	191	730	398	147	0	28	75	32	85	631
Split PHEV20	2045	med	high	Midsize	E85	1234	17194	668	0	1443	266	183	730	168	96	0	27	75	31	85	631
Split PHEV20	2045	med	high	Midsize	SI	1231	17189	667	0	1441	264	183	730	168	96	0	27	75	31	85	631
Split HEV	2045	med	high	Midsize	CI	1296	17802	430	0	2029	238	273	730	150	146	0	24	75	5	85	631
Split HEV	2045	med	high	Midsize	CNG	1239	17093	430	0	1427	269	185	730	394	146	0	28	75	5	85	631
Split HEV	2045	med	high	Midsize	E85	1205	16840	430	0	1438	240	179	730	168	95	0	25	75	6	85	631
Split HEV	2045	med	high	Midsize	SI	1202	16837	430	0	1437	240	179	730	168	95	0	25	75	6	85	631

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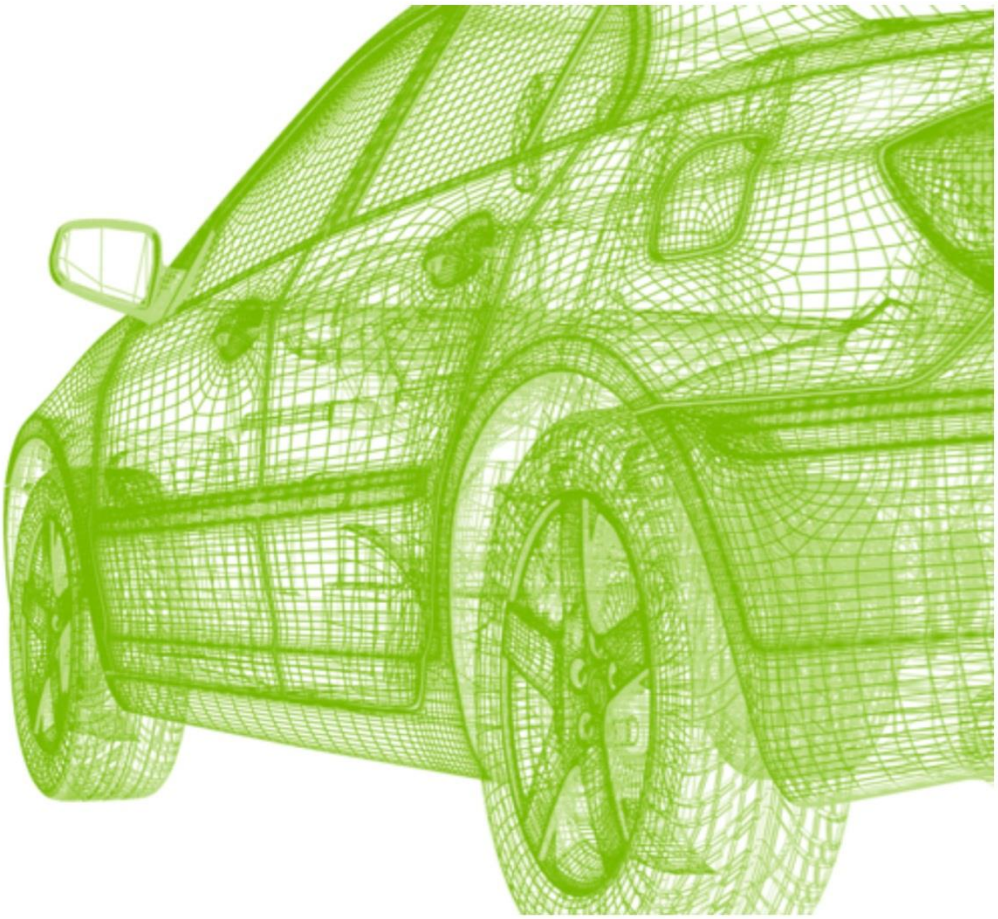

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