



Electric vehicle noncrash fires: an exploration of the data

► Summary

Concerns have been raised about the noncrash fire risk for electric vehicles after several high-profile fires. While there are currently a small number of electric powered vehicles on the road, they are growing in popularity. The Highway Loss Data Institute (HLDI) maintains one of the few databases that includes data about noncrash fire events. Noncrash fire events are rare and are typically associated with older vehicles. This HLDI study compares noncrash fire claims data for electric vehicles and their conventional counterparts. Observed noncrash fire claim frequencies were similar for the electric vehicles (0.19 claims per 1,000 insured vehicle years) and conventional counterparts (0.20 claims). Similar results were observed for the Nissan Leaf (0.16 claims) and Nissan Versa (0.15 claims). The Versa is similar in size and body style to the Leaf. This exploration included 104 noncrash fire claims for electric vehicles and 1,603 claims for conventional gas-powered vehicles, about double the sample size of our prior exploration of the data. While this data is thin, HLDI is publishing this exploration to document what is currently known about the noncrash fire risk for electric vehicles.

► Introduction

In 2020, less than half a percent of registered vehicles in the U.S. were powered exclusively by batteries. However, the numbers of electric vehicles are increasing dramatically. From 2012 to 2020, the number of registered electric vehicles rose from just 15,000 to more than 1 million. As they have grown more common, however, several high-profile electric vehicle fires have raised concerns that electric vehicles may be more prone to noncrash fire events (Matousek, 2018; Valdes-Dapena, 2018).

The Highway Loss Data Institute (HLDI) maintains one of the few databases that includes data about noncrash fire events. This HLDI report provides an examination of electric vehicle noncrash fire losses.

Noncrash fires are rare events covered under comprehensive coverage. For new vehicles (model years 2017–19), there are fewer than two noncrash fire claims for every 10,000 years of exposure. In contrast, for the same model year range under collision coverage, there is one claim for every 14 years of exposure. Exposure is measured in insured vehicle years. An insured vehicle year is one vehicle insured for 1 year, two vehicles insured for 6 months, etc.

The likelihood of a noncrash fire, while it remains small, increases as vehicles age. Prior HLDI studies on conventional gas-powered vehicles have found that the risk of a noncrash fire doesn't begin to increase until vehicles are 5 or 6 years old (2017, 2018a, 2018b, 2019). A prior exploration of noncrash fire data (2018c) for electric vehicles found electrics had an elevated noncrash fire claim frequency (0.23 claims per 1,000 insured vehicle years) compared with their conventional counterparts (0.14 claims). However, the vehicles in that prior study were only approaching the age of elevated risk. The oldest vehicles in this exploration — including many included in the earlier report — have reached this age threshold. This new exploration did not find the same elevated risk of fires for electric vehicles.

The exploratory results comparing electric vehicles with their conventional counterparts presented in this report serve to summarize what HLDI knows about electric vehicle noncrash fires. Because there are very few claims overall, regression results are not included.

Although HLDI may never have enough data to provide conclusive results on noncrash fires for electric vehicles, we will continue to monitor these vehicles and their observed noncrash fire frequencies.

► Vehicles

Two groups of vehicles were examined for this report, as shown in **Table 1**. The first group includes vehicles that have direct conventional counterparts with gasoline-powered engines. The electric series and its counterpart share the same platform and nameplate. Model years were limited to those in which both the electric and conventional versions were available. A total of ten vehicle pairs were included in this group, with model years ranging from 2012–20.

The second group contains the Nissan Leaf. It has no conventional equivalent, so it is compared with the Nissan Versa hatchback, which is of a similar size and body style. The model years included 2011–12 and 2014–19. The 2013 model year was excluded because the Nissan Versa hatchback was not produced that year.

► Results

Table 1 shows the two groups of vehicles and their exposures, claim counts, and claim frequencies. There are very few noncrash fire claims for these vehicles, particularly the electric variants. The Honda Fit and Smart Electric drive convertible have no noncrash fire claims.

For three other vehicles — the Hyundai Kona electric, the Volkswagen E-Golf EV, and Nissan Leaf EV five-door — noncrash fire claim frequency is higher than it is for the comparison vehicles. For the Ford Focus electric five-door and its conventional counterpart, noncrash fire claim frequencies are the same. Based on these small numbers, there are a few electric series vehicles that are at a higher risk of a noncrash fire in comparison with their nonelectric counterparts.

Table 1: Electric vehicles and their conventional counterparts noncrash fire exposure and claim frequency

Model years	Make	Electric series	Conventional Series	Electric exposure	Conventional exposure	Electric claims	Conventional claims	Electric claim frequency	Conventional claim frequency
2014–16	Chevrolet	Spark EV electric 5dr	Spark 5dr	24,911	369,671	3	66	0.12	0.18
2013–19	Fiat	500 electric 2dr	500 2dr	72,297	395,948	14	90	0.19	0.23
2012–18	Ford	Focus electric 5dr	Focus 5dr	28,058	2,370,585	5	421	0.18	0.18
2013	Honda	Fit EV station wagon	Fit station wagon	726	472,321	0	41	0.00	0.09
2019–20	Hyundai	Kona electric 4dr	Kona 4dr	4,987	57,645	1	4	0.20	0.07
2015–19	Kia	Soul electric station wagon	Soul station wagon	17,222	1,659,285	3	533	0.17	0.32
2013–17	Smart	Electric drive 2dr	ForTwo 2dr	16,318	117,618	4	39	0.25	0.33
2013–15, 2017	Smart	Electric drive convertible	ForTwo convertible	1,483	9,618	0	2	0.00	0.21
2012–14	Toyota	RAV4 EV 5dr 2WD	RAV4 4dr 2WD	10,003	1,123,619	1	159	0.10	0.14
2015–19	Volkswagen	E-Golf electric 4dr	Golf 4dr	44,609	214,500	10	29	0.22	0.14
			Total	220,614	6,790,810	41	1,384	0.19	0.20
2011–12, 2014–19	Nissan	Leaf EV 5dr	Versa	385,912	1,464,744	63	219	0.16	0.15

Some of the vehicles listed in **Table 1** have been recalled for defects that result in noncrash fires. Some electric vehicles such as the Hyundai Kona have noncrash fire recalls specific to the battery or charging system, while some conventional gas powered vehicles have noncrash fire recalls specific to their drivetrains. The table below lists these vehicles and descriptions of the relevant recalls. The Hyundai Kona electric and the Volkswagen E-Golf have higher than average noncrash fire claim frequencies. Both have been recalled.

Model years	Make	Series	Recall number	Recall description
2012–15	Ford	Focus electric 5dr	18V592000	An overheated cord can increase the risk of a fire
2015	Ford	Focus 5dr	18V169000	A transmission fluid leak in the presence of an ignition source such as hot engine or exhaust components can increase the risk of a fire
2016–18	Ford	Focus 5dr	18V845000	A transmission fluid leak in the presence of an ignition source such as hot engine or exhaust components can increase the risk of a fire
2019–20	Hyundai	Kona electric 4dr	20V630000	An electrical short in the Li-ion battery increases the risk of a fire
2015–16	Kia	Soul station wagon	19V120000	Piston damage may result in an engine stall, increasing the risk of a crash. A broken connecting rod may puncture the engine block allowing engine oil to escape. The leaking oil may contact the exhaust, increasing the risk of a fire
2015–16	Volkswagen	Golf 4dr	18V329000	Modifications made while the vehicles were in an internal evaluation period may cause the affected vehicles to not comply with all of the applicable regulatory requirements. If the vehicle does not meet all regulatory requirements, there could be an increased risk of a crash, fire, or injury
2015–16	Volkswagen	E-Golf electric 4dr	18V329000	Modifications made while the vehicles were in an internal evaluation period may cause the affected vehicles to not comply with all of the applicable regulatory requirements. If the vehicle does not meet all regulatory requirements, there could be an increased risk of a crash, fire, or injury

► Discussion

A prior exploration of noncrash fire data for newer electric vehicles found electric vehicles had an elevated noncrash fire claim frequency compared with their conventional counterparts. That difference is not present in the current analysis. When the prior exploration was published these vehicles were newer. Prior HLDI studies on nonelectric vehicles have found that the risk of a noncrash fire doesn't begin to increase until vehicles are 5 or 6 years old. Many of the vehicles in this report are now of an age where the risk of a noncrash fire begins to increase. Although HLDI may never have enough data to provide conclusive results on noncrash fires for electric vehicles, we will continue to monitor these vehicles and their observed noncrash fire frequencies.

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The Highway Loss Data Institute is a nonprofit public service organization that gathers, processes, and publishes insurance data on the human and economic losses associated with owning and operating motor vehicles. DW202104 LH

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