

## Report on C8 Front Wheel Drive Hybrid

(1st Written/Posted December 2019. This Revision June 2023)

(Continually Revised Including After E-Ray Reveal & Bash)

(Includes Why E-Ray Development Started with the C8 in ~2012/2013)

### History of C8 Hybrid (First Semi Formal, Leak)



Early information about a probable FWD C8 Hybrid was in a February 2019 published interview with Andy Pilgrim (pic left) in “*Corvette Online*” by Andy Bolig.

Andy Pilgrim based at National Corvette Museum was conducting safety driving habits at schools. Andy’s professional racing started in 1996 when he made his 24 Hours of Le Mans debut. He raced for the Chevrolet Corvette factory team from 1999 to 2004.

In the interview, he discusses the C8 suspension setup saying, it’s quite complicated to eliminate oversteer with a rear heavy car. But the Chevy engineers have achieved that objective. It will be a better handling vehicle and have much greater potential for a quick race car.

Not prompted by the interviewer, he made this statement as an ME benefit, “*Now you’ve got the room to put alternate power up front.*”

### The Hybrid, AWD C8 Corvette

An article written by Bozi Tatarevic in Jalopnik late November 2019 could be a “controlled leak by GM!” It states it’s from “official documents” and has very specific details that probably came from someone who knows them- OR was it “leaked” by GM similar to Pilgrim’s info, which was coincidence?

IMO the E-Ray “Performance Hybrid” with the LT2 engine was started in 2012/2013, same time as the C8 for a main reason - long term, to significantly improve mpg. The Jalopnik article also stated **a hybrid would be in the standard C8!** It would probably have to be in a slightly different configuration more like a Prius type hybrid. **Why?** Because the 2012 EPA Published Plan and Press Release outlined the requirement of having the “Corvette Family” progressively improve mpg starting in 2017 and achieve ~39 mpg by 2025. That plan was put on hold by a “PEN” January 2017. There is another “PEN now that in April 2022 quietly announced a reinstatement of requiring higher mpg but with limited details. Details of the original 1174-page document and what limited details were released in April 2022, are in this report.

In summary, the goal moved from that outline in a 2012 Press Release, 54.5 mpg for the “average car and light truck” in 2025 to an “average” 49 mpg in 2026. The prior plan had details presented in a 1174-page report (*which I read and is on the Net.*) *There are a few details for the 2022 new plan.* Will it be by car “family” as before? We don’t know. Also, those in charge in DC are saying ONLY ZERO FOSSIL FUELS will do. **That is where the Government and GM are heading!**

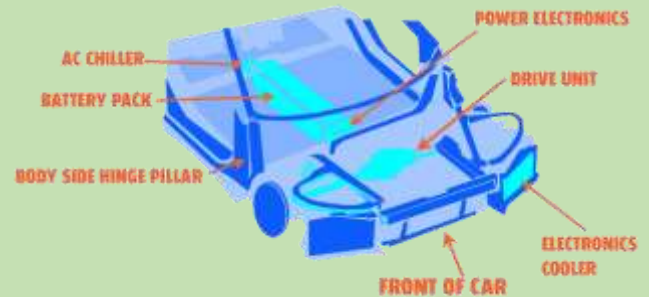
# Photo Sequence

The November 2019 Jalopnik article defines the C8 Hybrid having 114 electric hp a 16,000-rpm motor and the 495 hp LT2. With an 8:1 gear ratio it produces 880 ft-lbs of torque. A rectangular case of batteries fit in the center tunnel. Article Pic right.

The 1/17/2023 E-Ray Reveal showed 80 Pouch cells with a small 1.9 kWh capacity.

Prius for years had a 4.4 kWh battery and was achieving 51 City/ 48 Highway mpg. Toyota (who with others advised technical details for the report) said their planned RAV4 SUV plug-in-hybrid with a small 1.6-kWh nickel-metal hydride battery would achieve 94 MPGe combined (miles per gallon of gasoline-equivalent.)

Details from Report: ICE 495 hp LT2; Electric FWD 114 hp  
Hybrid Battery 1.92 kWh  
Rear Tires 345/25R21; Front Tires 275/30R20



The 1/17/2023 reveal showed it was very close to the 2019 leak. However, power is 160 hp versus 114 and max rpm 18,000.



This is a Link to the Jalopnik article: <https://jalopnik.com/what-we-know-about-the-hybrid-all-wheel-drive-c8-corve-1839885240>

Hybrid is reason for no standard shift C8!

The November 2019 Report also stated a Hybrid will be "in the standard C8." Probably was planned from the start, but now Zero CO<sub>2</sub> emissions is the Government and for GM an ONLY EV approach. The "most C8s would have to be hybrids" statement is probably a key reason there is NO C8 STANDARD SHIFT. Has been my contention since early 2019 and now it's being validated! **ROFL**

Pic Left: From the increase in tire size, thought it might be called the C8 Grand Sport. I estimated fender width from tire size. My rear width guess was close at 3 inches versus actual 3.6 inches!



Former GM engineer validated the E-Ray started design the same time as the C8.

The 2019 report stated and my conjecture that a key reason for no standard shift was most C8s were planned hybrids in 2025. That would be required for most Vettes to meet the 2025 government planned ~39 mpg for the Corvette family. A video by a GM engineer said he would not talk about his very early hybrid work until after the E-Ray was announced. He worked on the development since the start of the C8 design. They worked in secret rooms etc.

It was also validated by an excellent automotive writer Don Sherman that the hybrid design started very early.



The detail of the front spindle and coilover was also leaked in words and this pic (less my added yellow axle!)

Quoting the article, *“Although it was readily apparent that there was a spot for the axle shafts, it wasn’t clear how they would get there as the coilover/damper was in the way. The coilover bottom mount has been replaced by a split yoke where essentially a forked mounting left a space in the middle for the axle.”*

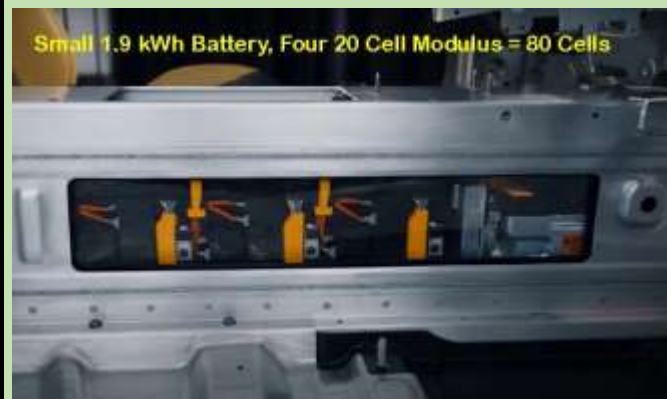


**The Following Pics and Comments from GM 1/17/2023, E-Ray Reveal And Video After Bash May 1.**

This is an actual pic supporting the words in the leaked article November 2019. Can see how the front axle goes through a split lower yoke on the coilover bottom. Pic from a video Interview of Mike Kutcher E-Ray Lead Vehicle Development Engineer

This pic shows an item “leaked” in the November article and in the accompanying sketch. The battery location.

It is NOT the GM Ultium battery designed for EVs. It is a small, 1.9 kWh battery capable of very fast withdrawal and charging. NOT storage capacity. As leaked, it’s in the center tunnel. It’s like an F1 battery, some refer to it “more like a slow charging capacitor!” It used Pouch Cells for their light weight and high energy density, weighs <100 lbs (some quote 80 lbs.)



The electric motor is 160 hp, more than predicted! It weighs 80 lbs and takes almost no room away from the Frunk!

It and the battery are made by LG Energy, GM’s Ultium partner. The Ultium battery is Lithium-ion with nickel-manganese-cobalt-aluminum. It reduces expensive cobalt by ~70 percent. The aluminum helps prevent lithium spike formation during fast charging, which can short-circuit a battery.

During a walkaround of the E-Ray cutaway Aaron Link, GM High Performance Chevy Manger noted this vertical cooler for the drive train power supply. The 2019 sketch referred to it as Electronics Cooler.

Tadge in a video said there is coolant for the electric motor that has a magnesium case. It uses aluminum bolts for corrosion and weight reasons. Assume the motor cooling system may be part of the next pic.



Aaron Link said there are three E-Ray coolant systems. He pointed out pictured coolant pump and heat exchanger. He indicated the top 1/4 of the heat exchanger was for the electronics. Perhaps the bottom 3/4 is for the motor? Delivering 160 hp of power takes an inverter. As our welding inverters, the power transistors have large heat sinks that must be cooled. We used large fans and air to cool welding power supplies.

The other coolant circuit is for the battery. The leaked report calls it an AC Chiller. That was reinforced at the Bash, it is a chiller. Not sure how it's powered. Probably like Tesla with its hybrid battery. Optimum Battery temp is 100 F not colder or hotter. Assume the cap is for coolant.

Recall Jay Leno showed his Tesla Batteries were in a coolant box. Yep, when delivering 160 hp, batteries do get hot!



Some other points of interest from the cutaway walkaround.

This is the pic of the added coolant rad that is also in the C8 Z06. It is in the center between the right and left coolant rads. Note no AC Condenser in front. *Have some left over Custom Car Grill Mesh from my C8, will have to use to make a "protector."*



Aaron Link said the E-Ray springs are more like Z51 rate, not the stiffer Z06. However, he did say there are some suspension differences with the ZER Performance Option that includes the base C8 Z06 Summer Tires. Perhaps only bushing compliance to match the tires or MRC calibration.

After Bash found ZER option, has only Summer tires. It does come with spoiler extensions in trunk. In the Steve Garrett Podcast Tadge Juechter said there are NO difference and unlike the standard C8 where they have the suspension matched to the tires and don't recommend changes to Z51 tires on the base car (and vice versa) in this case it's not a problem. No suspension differences – not needed.



Can see from tread pattern why the extra 10% lateral “g.” More tread area on ground. Tire construction and rubber compounds are probably different.



The E-Ray increased weight over the C8 Z06 is 340 lbs., both with Carbon Ceramic brakes.

In fact, over the C8 Z51 @ 3,647 lbs it's 3890 lbs only 243 lbs heavier (Both GM #s as curb weight).

As typical of early info regarding weight there are various numbers being mentioned. Some from GM a few others. Comparing apples and apples is not easy. When the production models hit the streets expect we'll get better numbers!

Dry weight is the same as Curb weight less required fluids.

## 160 hp Versus Leaked 114 hp - WHY?

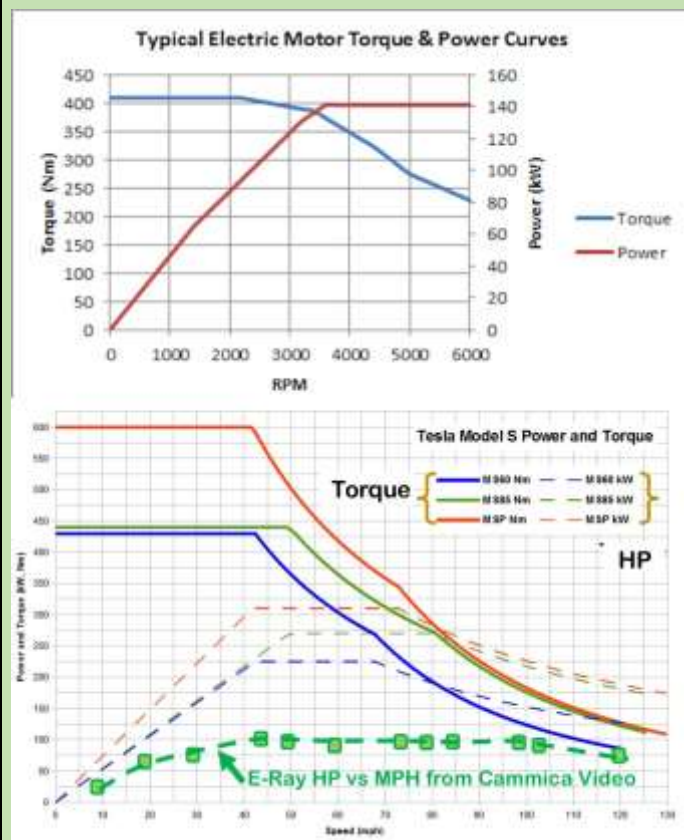
The one surprising difference between the leaked November 2019 report is the 160 hp E-Ray electric motor versus the quoted at 114 hp. All were happy, including myself, but then we saw the Hagerty supported Jason Cammisa Video ¼ Mile tests.

The E-Ray beat lighter, Ferrari, Lambo and C8 Z06 times:

Using their #'s

	HP	Weight
C8 Z06	670 HP	3670 lbs
Ferrari F8	710 HP	3650 lbs
Lambo Huracan EVO	602 HP	3674 lbs
E-Ray	495+160 HP	3924 lbs

BUT Max Power was only 130 hp at 43 mph. You could observe some hp drop as speed increased. Jason said at the Trap speed of 129 mph it was "Well Under 100 hp." WHY?



I don't have the answer and Jason's mention of "the E-Ray front wheels were losing traction because of weight transfer," is logical at launch BUT NOT at 43 mph. But he does not actually say that is the reason for max 130 hp measured at 43 mph.

I'm no electric motor expert. BUT these graphs compare torque and HP of typical electric motors with what Tesla published. Tesla and others use:

**"Three phase AC, permanent magnet synchronous motors, liquid cooled with variable frequency drive."** They have different torque and hp outputs compared to simple electric motors as noted in pics. Torque for Tesla motors starts dropping at ~30% of max rpm. Tesla's lowest power motor dropped from Max ~300 hp @ ~43 mph to ~200 hp at 100 mph, about ~33%. I plotted the E-Ray data from the video in Green. If extrapolated it may drop about the same.

Unlike some who saw the video and blamed the battery. *It's NOT the battery losing capacity to deliver power in 10 seconds!* It appears to be the motor characteristics. The difference from 160 hp to 130 hp shown might be drive train losses?

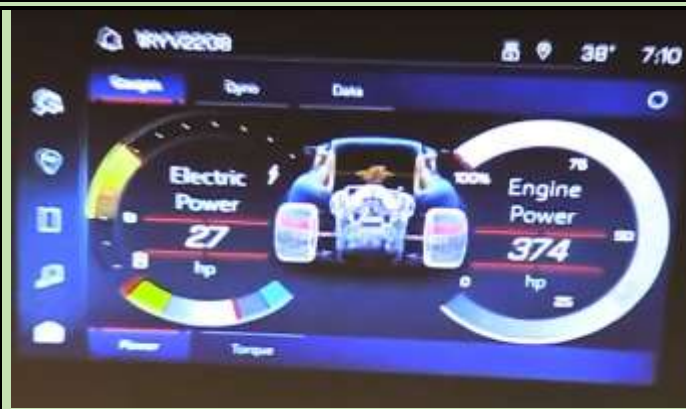
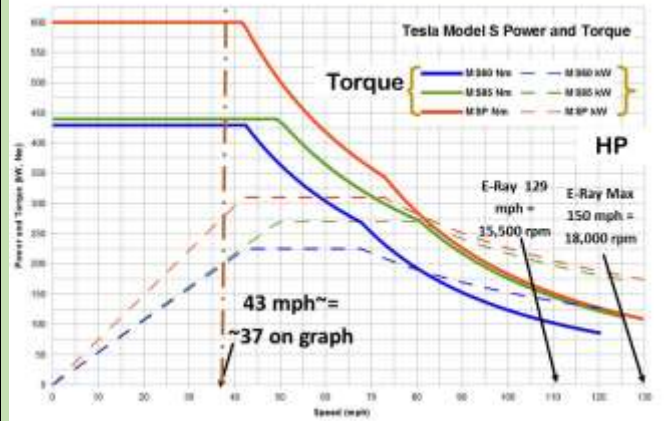
Lower Pic is only speculation using the Tesla Curves and what is known about the E-Ray motor. It provides some explanation of the low Trap speed power !

The E-Ray motor is rated at 15,000 rpm Max (after that it is disconnected from the front wheels.) It is said to produce 160 hp (120 KW) and 125 ft-lbs of torque (165 Nm) through an 8.16:1 final drive.

Using the Tesla Data as a SWAG; as seen in the top pic, E-Ray Max power was 130 hp at 43 mph on the E-Ray center screen in the Cammisa tests. The test video showed HP dropped off slightly to ~105 mph.

No screen data shown as it reached the ¼ mile at 129 mph trap speed. But Jason said it was "far less than 100 hp." By these very rough SWAG created numbers, if 160 hp max it would be about 33% less (+/- shotgun range) = !105 hp at trap speed of 129 mph.

As said, this is just a rough idea of why it's lower at 129 mph! It's using Tesla curves so at best and indicator. We'll have to wait for someone to put the front wheels on a dyno to get some actual curves and numbers!



The E-Ray has optional displays that can be placed on the center screen.

This screen displays Electric Motor HP and LT2 HP.

Tadge Juechter said Techies will like this detailed data that can be displayed. Sure hope it's able to be stored and reviewed later. Don't want to be distracted from the only focus with a moving car-driving!

Funny, Tadge said exactly that in a post about the eSLD % Slip data. He said don't be looking at this data as you're at a high "g" turn. Focus on the road and driving!





**Other info After Bash**

**Pics of actual Car in Cacti that was at Bash.**

**Note. Other info that was available is Ground Effects Option does not include a side skirt difference, only CF spoiler.**



**Artemis Interior that was at Bash. Looks much better than the GM Build-An-E-Ray website.**

**Cacti and Artemis are what I'm choosing for my E-Ray.**

**Some pics from Plant Manager at Bash.**

**This pic is Battery compartment being installed.**

**First production occurs in the 1<sup>st</sup> week in May BUT only a few for GM folks to drive. When finished they will be sold to the public as they are the design spec.**



**Front motor and suspension on carrier. Those are Styrofoam covers for Carbon Ceramic Brakes. They are brittle, and the plant manager said the foam is to be installed when removing wheels. Not sure why as have to be removed to install new wheel, brake pads etc.**

***E-Ray corner handling control is accomplished by activating the carbon ceramic brake on the desired front wheel! They were probably selected for that function, light weight and for the heavier ~243 lbs more than a C8 Z51.***



This Link to a publised Press Release in 2012 by the EPA is based on a NHTSA (National Highway Traffic Safety Administration) 1174-page report. It states by planned requirement, starting with inceases in 2017 the avearge car and light truck would get 54.5 mpg by 2025! The report shows 2 seat sports cars, like the Corvette, would “ON AVERAGE” of all Vettes sold, achieve ~39 mpg by 2025:

<https://obamawhitehouse.archives.gov/the-press-office/2012/08/28/obama-administration-finalizes-historic-545-MPG-fuel-efficiency-standard> .....

This is the Press Release Title:  
*Administration Finalizes Historic 54.5 MPG Fuel Efficiency Standards*

*In 2012 GM, Ferrari, Porsche etc knew what was coming. They had to make plans.*



In addition to significant extra power and Front Wheel Drive the benefit of a C8 hybrid is the “possibility” to operate like a Prius and gain *significantly improved mpg!* In addition to software, it would need a bigger and/or different type of battery. That would happen when high mpg was “forced by a government!”

All vehicles would be covered and placed in “Families.” The 2025 goal for the “Corvette Family” was 39.8 mpg! The method used to define each family requirement, although complex, is very rigorous and logical. When stopped by a PEN January 2017, California tried to implement the plan, but the US government stopped that action in court.

Note below the Corvette example is a 500 hp Mustang that only required 31.7 mpg! That is partly due to hp and having 4 seats!

Basically “grocery getters” with low hp, seating 4+ that could achieve high mpg would have that goal. Note the Toyota Corolla would have required 60.8 mpg.

*Companies like Toyota participated in this plan. It was not pie in the sky!*

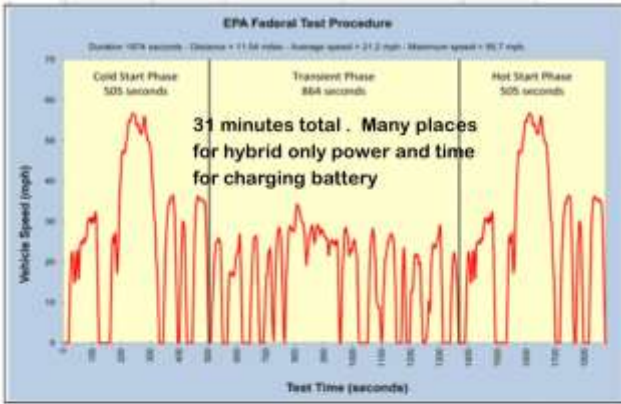
**1174 Pages!**  
**Corporate Average Fuel Economy for MY 2017-MY 2025 Passenger Cars and Light Trucks**  
**Corvette = 39.83 mpg**

Table V-4 - Sample Adjustments for Horsepower to Weight, Cars

Manufacturer	Model	Name Plate	Horsepower	Footprint	GPM	MPG	Adjusted GPM	Adjusted MPG	GPM % Adjustment
HONDA	HONDA FIT	FIT	129	35.1	0.02	69.40	0.0217	60.80	13.0%
TOYOTA	TOYOTA COROLLA	COROLLA	126	42.3	0.02	69.54	0.0204	60.80	13.0%
FORD	FORD FOCUS	FOCUS FWD	140	41.7	0.02	61.94	0.0217	56.24	9.9%
GENERAL	CHEVROLET MALIBU	MALIBU	189	46.9	0.02	53.76	0.0202	54.08	-0.7%
HONDA	HONDA ACCORD	ACCORD 4DR SEDAN	190	46.6	0.02	57.37	0.0219	55.75	3.3%
HONDA	HONDA ACCORD	HYBRID SEDAN	190	37.6	0.02	70.43	0.0206	60.36	14.3%
GENERAL	CHEVROLET CORVETTE	CORVETTE	480	46.3	0.02	48.84	0.0213	39.83	2.3%
FORD	FORD MUSTANG	MUSTANG	306	46.7	0.02	51.32	0.0216	31.87	-1.2%

The Toyota RAV4 SUV plug in hybrid was planned with a small 1.6-kWh nickel-metal hydride battery. It was estimated to achieve 94 MPGe combined (miles per gallon of gasoline-equivalent.)

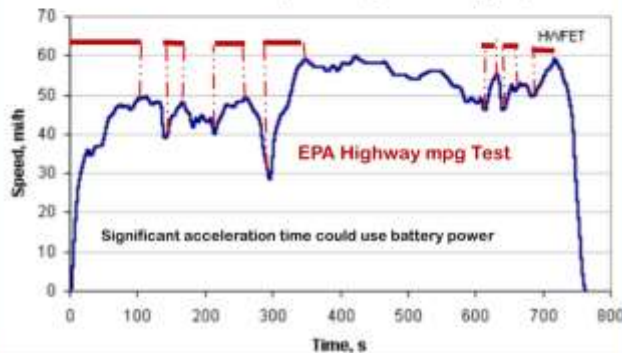
All plans have changed with the new US (and some countries in Europe) zero fossil fuel planed laws!



City: Represents urban driving, in which a vehicle is started with the engine cold and driven

Test Time = 12.8 minutes; 10.3 miles; average 48.3 mph

Combined fuel economy = 55% City and 45% Highway



Note, since 55% of the average mpg is based on the City drive cycle, a major improvement in it, which appears possible, could improve the average with modest Highway mpg gain! For example, 55% X 45 mpg + 45% X 32 mpg = 39.1 mpg average!

## How could ~40 mpg be achieved?

WOULD NOT BE with the Performance Hybrid outlined in the November 2019 report or the 2024 announced E-Ray. The E-Ray needs different software and an additional and or different battery. The Prius type E-Ray would only start the ICE when the electric drive reaches 40 to 45 mph "in normal driving." Still could operate both from a start at high throttle input.

Parts of the EPA City drive cycle can be done with only the electric motor hybrid. There are many decelerations, to recharge the battery. Even the highway cycle can benefit. Operating in 4-cylinder mode, instead of switching to V8 mode when moderately accelerating to another speed or going slightly uphill the hybrid can provide the needed extra power.

Expect GM (or any car company) would not institute a full Prius approach until a "government" takes the blame by forcing higher mpg. **Sports car buyers would not be happy. Best a government takes the blame.**



An R&T article by Jason Cammisa had an interesting comment re the brake by-wire assist related to the C8 Hybrid: **"Once you start thinking about a hybrid Corvette (by-wire assist) really starts to pay dividends. Hybrids use blended brake systems that continually shift braking duties between regenerative braking and conventional friction braking. This leads to inconsistent and unusual pedal feel that a by-wire assist eliminates!"**

*I recall F1 drivers having to balance how much friction brake they used for a turn integrating "if" their KERS would be aggressively charging their small battery. Sounds like "by-wire assist" can help compensate for that variability.*



In a December 13, 2019, Autoline Afterhours interview Tadge stated, they are part of GM and follow Mary Barra's "000 Goal," which includes zero emissions! He said they follow the World Environmental regulations and want to help "preserve the planet."

With the current government in charge, reduced CO<sub>2</sub> emissions is not enough. Only no fossil fuels will do. That is where Mary Barra is taking GM. She took half the Corvette engineers to work on EVs. All GM capital is directed of have only EVs in 2035!



Assume a Prius Type E-Ray with LT2 engine can meet ~39 mpg average per above estimates. The progressively higher goals, leaving out low volumes of Z06 and Zora, they could have been:

With standard C8 EPA Average = ~20 mpg  
 Year 1: ~25% Prius E-Ray @ 39 mpg = ~24 mpg  
 Year 2: ~50% Prius E-Ray @ 39 mpg = ~30 mpg  
 Year 3: ~75% Prius E-Ray = ~34 mpg

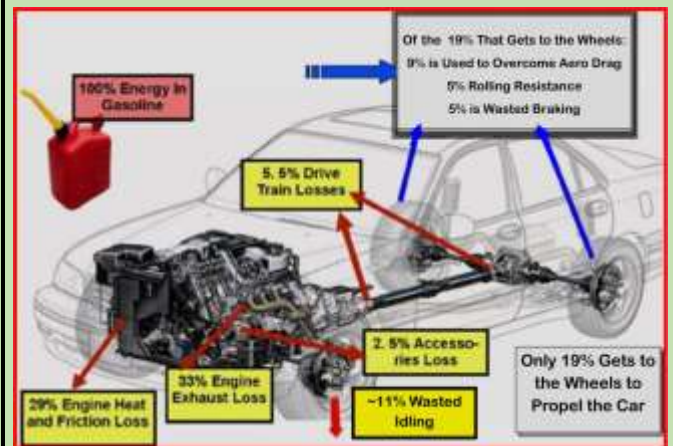
So, in 2026 the current administration goal they could achieve that ~39 mpg. However, the current administration goal of 49 mpg has no details of how measured. IF like the 1174-page report by Car Family, that 49 goal is less than the prior 54.5. Perhaps the Corvette would only be 49/54.5 X 39 = 35 mpg. **ACHIEVABLE.**

***BUT frankly if the government doesn't come off their no fossil fuels, why waste time and money for an interim solution! Have to agree from a business standpoint with what Mary and GM President Mark Reuss said: Hybrids are a waste of time.***

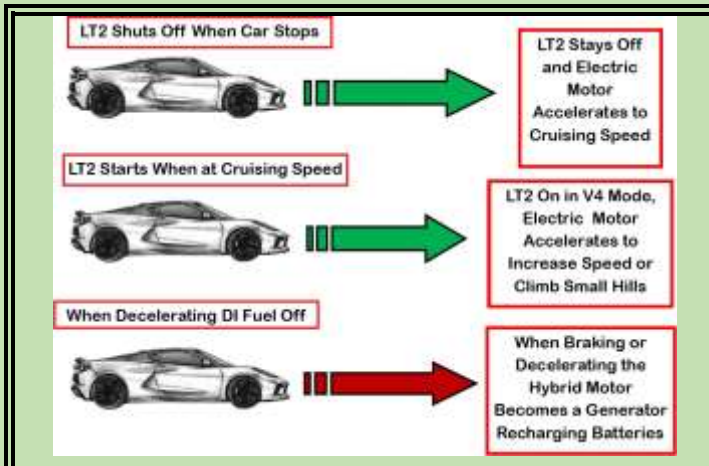
The figure right is made from recent EPA "average" energy use data. Shutting the LT2 off when the car stops can save some of the ~11% wasted gas energy used.

Braking also consumes about 20% of the 19% energy that gets to the rear wheels to propel the car. Much of that can be captured and stored to recharge the battery.

As seen in the pic right, only 14% of the energy in gasoline is used to propel the car forward! F1 race car rules have been designed to achieve higher efficiency and recover some of that wasted gas. They now are not allowed to refuel and use hybrid and other methods to recover some of that wasted energy!



F1 race cars use about half the fuel energy they did in the past. Refueling is not allowed and overall speeds exceed those in the past on many of the same racetracks! It can be done!



The key to significant C8 mpg improvement is to STOP the LT2 when the car stops or when driving slowly. Then use the Hybrid motor to accelerate the car in “normal driving” to ~45 mph near cruising speed before restating the LT2.

When braking or decelerating the DI shuts fuel off and the Hybrid motor becomes a generator, recharging the hybrid batteries that propel the car.

After the the reveal, Don Sherman, for one, in a SAE International article said the hybrid was part of the original C8 design. Aaron Link said something similar.

It's obvious GM and Ferrari decided Prius type Hybrids were their method of achieving the high mpg goal that was to become law starting in 2017. That required a Hybrid and “automatic transmission.” Can't work with a standard trans. So, GM knew there would be no standard shift from when they started to design the C8 in 2012/2013.

I have speculated a key reason the C8 only has a DCT (and Ferrari who stopped standard shift cars in ~2012/2013) related to both planning hybrids that require a computer in control of shifting!



A “standard shift” Prius type hybrid would have to communicate what gear to shift to when it was starting the ICE. ROFL



**Ferrari was Planning 60% Hybrids in 2022!**

In an interview before the pandemic, Ferrari CEO Camillari said they wanted 60% of Ferrari's sold in 2022 to be hybrids!

Ferrari's 1<sup>st</sup> hybrid was introduced in 2013, the LaFerrari. It had a 789 hp V12 with a 161 hp electric hybrid.

The pandemic has changed everyone's plans. The US, for political reasons, has moved to zero fossil fuels.



Ferrari introduced the SF90 Stradale hybrid in 2019. Its turbocharged 4.0-liter V8 produces 769 horsepower, and it has an additional 217 hp electric hybrid drive for a total output of 986 hp. The most powerful road-going Ferrari ever produced.

## Fuel Economy

The EPA estimates the SF90 will get 18 mpg on only gas and 51 MPGe when running on both gas and battery power.



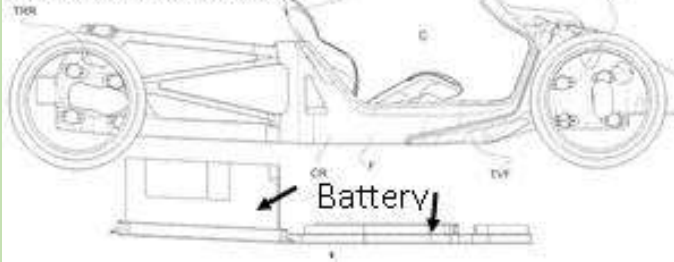
Plug-in Ferrari Hybrid SF90 Stradale.

## Ferrari Comments 2023

### *Possibly 2025 Ferrari 4 Motor EV*



Ferrari EV Patent



In June 2022 Ferrari said: they will have an EV sports car in 2025 and will be 40% EV's by 2030 and will be 80% electrified at that time. Therefore 40% EVs, 40% hybrids and 20% only ICE Sports Cars.

In May 2023 Ferrari CEO Benedetto Vigna was quoted as saying that the company would be "arrogant" to dictate what customers can buy despite calls for sustainable transportation. Vigna added that Ferrari would continue to resist EVs and instead build ICE cars, building on "an essential part of the company's heritage."

*Somewhat cynically, he may be right! They may not be able to sell the 20% ICE only sports cars in the US or Europe BUT no problem selling in China! They are laughing, building new coal fired power plants powering some with US coal!*

## Porsche Says No Manual Box for Hybrid:

In an article published a few years ago: "Porsche VP and engineer in charge of a hybrid model, Dr. Gernot Döllner, said hybrid and/or electric cars from the brand would only make sense with automatic (or PDK) gearboxes. According to Döllner, they can only be efficient with an advanced automatic gearbox. In a hybrid 911's case, the PDK wouldn't be there to decrease track times, but to increase efficiency."

**Note:** In February 2020, a forum poster quoted engineers at Porsche's Tech Center saying they planned 50% EV's in 2025. That could have offset non-hybrid models. BUT if US laws require no fossil fuels for new car sales, like California, will have to be all EVs!

Porsche stated their plan to meet their improved 2025 average required high mpg in US (Europe has similar requirements stated at a more logical MAX CO<sub>2</sub>/km) in a July 2018, headline:

***Porsche Plans EVs to Account for 50% of Business by 2025***

The press release also contained some new details about the vehicle as well as Porsche's EV strategy. The company strategy is to electrify 50% of vehicles sold by 2025, or more particularly, total sales. Porsche also specified that among the EVs, they also plan a 50/50 split between battery electric vehicles and plug-in hybrids. By 2022, they will invest 6 billion euros into the expansion of their EV production.



Pic from July 2018 Press Release of estimated EV Sports car.

Like Corvette and Ferrari Porsche will have to rethink their plan as the US and Europe will only allow zero CO<sub>2</sub> emissions cars to be sold.

***Perhaps like Ferrari etc. they will plan on selling ICE engine sports cars to China!***

## **Porsche 2023**



A hint at what the 718 EV Cayman might look like.

Porsche's Mission R race car concept, features a Cayman-like body and a 900-V battery.

May 15, 2023, Article:

"We are stepping up our electric offensive with another model. By the middle of the decade, we want to offer our mid-engine 718 sports car exclusively in an all-electric form," Porsche CEO Oliver Blume said.

According to a report from Car and Driver, the 718 EV will be all-new with nothing carrying over from the prior naturally aspirated model. The model will be built on the Volkswagen Group's PPE platform and is expected to be just as well-balanced with the battery being mounted near the firewall where the engine used to reside. Fast-charging is expected, assisted by 900-V electrical architecture.

The EV sports car's targeted weight is 3,650 pounds. Car and Driver says expect the base model to be powered by a single motor offering at least 450-horsepower to the rear wheels, with a second motor available later on to drive the front wheels, transforming the 718 into an all-wheel-drive monster.



Don't confuse my discussing improved mpg technology with me being a "Tree Hugger!" Frankly, I'm not! My '34 ProStreet Rod with its 502 cid engine gets ~10 mpg!

BUT I'm all for using technology so as not to waste energy.

I feel like Andy Cowell, managing director of Mercedes High Performance Powertrains, who said about F1 planning to eliminate MGU-H (Motor Generator Unit, Heat, the energy saving function that used otherwise wasted turbo energy when boost was not needed.) He said MGU-H provided 60% of the electric energy used to power their F1 cars and contributed 5% of the current engine's thermal efficiency.



engine air pressure boost is not needed to operate a generator and can also power the turbine compressor with an electric motor) provides 60% of the electric energy used to power the other part of the energy recovery system and contributes 5% of the current engine's thermal efficiency.

- We'll have to come up (*in 2021 F1 when it's banned, because of complexity of managing for smaller teams and the really "stupid" but understandable reason - it reduces engine sound*) with various systems and devices and that will probably involve burning some fuel through the exhaust, *which doesn't feel the most honorable thing to do as an engineer.*

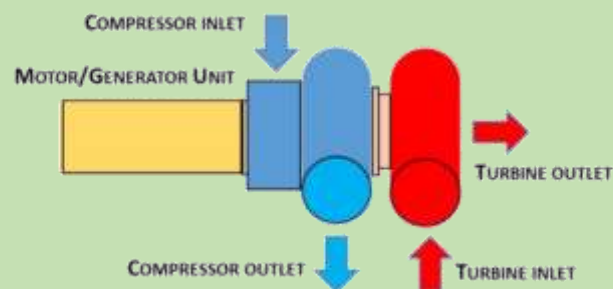
*I feel similar to Andy Cowell. IMO it's better to improve the ICE efficiency, best as possible, before being forced to go to EVs!*

Quoting:

- MGU-H (Motor Generator Unit, Heat, (MGU-H, the energy recover system that uses turbo power when



When "Turbo Boost" is not needed for the engine, turbine power is diverted to a generator to charge the battery as AND as a motor it can also power the compressor before the turbine spools up!



This published article will help some to understand what was going to be US LAW in 2017 and why GM had to plan on achieving ~39 mpg for the average Corvette by 2025 (BTW, so did Ferrari, Porsche etc):

<https://obamawhitehouse.archives.gov/the-press-office/2012/08/28/obama-administration-finalizes-historic-545-MPG-fuel-efficiency-standard> ..... This is the Article Title:

### **Administration Finalizes Historic 54.5 MPG Fuel Efficiency Standards**

BTW, Sports Cars have a lower mpg requirement, some small sedans were to require 60 mpg! Here are some clips from the article! It's filled with propaganda stating automakers applaud the concept! They expected some gullible folks to buy that BS. That's until they saw the implications and didn't like the result! Especially most sports car folks!

*"Last year, 13 major automakers, which together account for more than 90 percent of all vehicles sold in the United States, announced their support for the new standards. ...*

*"Simply put, this groundbreaking program will result in vehicles that use less gas, travel farther, and provide more efficiency for consumers than ever before—all while protecting the air we breathe and giving automakers the regulatory certainty to build the cars of the future here in America," ...*

*"The fuel efficiency standards the administration finalized today are another example of how we protect the environment and strengthen the economy at the same time," said EPA Administrator Lisa P. Jackson. Innovation and economic growth are already reinvigorating the auto industry and the thousands of businesses that supply automakers as they create and produce the efficient vehicles of tomorrow. Clean, efficient vehicles are also cutting pollution and saving drivers money at the pump."*

**Note:** Perhaps the C8 "hybrid" with Prius style software (*i.e., in normal cruising ICE only starts at 45 mph forced Stop/Start, etc.*) can achieve high mpg with a smallish battery.

*Some key points from a June 2020 article about the new Toyota RAV4 Prime plug-in hybrid with an even smaller 1.6 kWh battery versus the E-Ray 1.9 kWh.*

*The RAV4 Prim will have an estimated "battery-only" range of 42 miles. It will also be the quickest RAV4, with 302 horsepower and a zero-to-60-mph time of 5.7 seconds. It uses a 2.5-liter inline-four engine mated to a pair of electric motors (one driving the front wheels and another one driving the rear wheels). The electric motors draw energy from a 1.6-kWh nickel-metal hydride battery mounted under the rear seats. Cargo capacity is not affected. Combine that powerplant with the Prime's electric motors, you get a combined 302 horsepower. Not bad for a "green" SUV.*

*The plug-in RAV4 will have all-wheel drive as standard. It's estimated it will achieve 94 MPGe combined.*



This is what's next for the Vette, E-Ray is only interim! Proably will not see the Prius type hybrid. As Mary and GM President Mark Reuss stated, wasted effort.

With the public not convinced EV "grocery getters," SUVs or pick-ups are what they want, even with the government push and subsidies GM needs to create EV excitement.

We'll see just what GM comes up with BUT expect it will be here sooner than needed as a C8 replacement. Mary Barra with her "only EVs in 2035" needs young folks who will be buying cars to be putting Posters of sexy, exciting, high performance EV Corvettes on their bedroom wall!



GM is investing over 35 Billion dollars in combination with LG Chem to produce a new technology LiNiCoAlO<sub>2</sub> battery. Not brand-new technology but they believe they can reduce or eliminate the costly, limited supply Cobalt that will reduce costs. There is a safety concern, and their solution has not been discussed.

With Mary Barra's commitment to zero emissions assume GM engineers are working on an EV cars and trucks including the next Vette, the C9.

With many Corvettes' spending much time in a garage and used for short trips on weekends, a small capacity battery option could be used for a "Low-Cost Base Model." Pay more and get a longer range, bigger battery C9.



September 9, 2020, Published Report by Zane Merva (condensed):

### Electric All-Wheel-Drive Hybrid Coming to the C8 Corvette

It's reported documents have been seen indicating electric all-wheel-drive (eAWD) will be an option on the Stingray coupe and convertible versions as soon as the 2023 model year. The Corvette with eAWD would be a hybrid. ***"That's not how Chevy will market it. The feature will most certainly be performance oriented."***

(My Note: ***Yep, the E-Ray is here for 2024!*** That is exactly how I said it would be done by GM, Ferrari etc. until a "government" dictates it will not start the ICE until in "normal driving" the electric motor brings the car to cruising speeds by making higher mpg or lower CO<sub>2</sub>/km in Europe a legal requirement! )

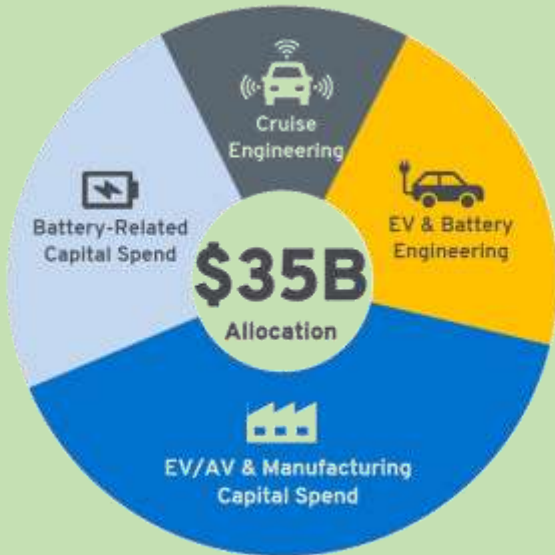
"We're unsure how eAWD fits into an all-electric C8 Corvette, Speculation has been rampant for years that the C8 Corvette would feature an electric version."

Either way, this is a game-changing move for the mid-engine Corvette, which is already capable of 0-60 times under 3 seconds. Imagine the added torque that would be provided by one or two electric motors providing juice to the front wheels.

"It's entirely possible the eAWD Corvette could move independently of the rear wheels and V8 engine... and in theory travel silently. They could be different cars entirely...or the same feature described by many people."

It speculates it will use GM's Ultium Battery system and would have a plug-in cord for recharging. ***That was wrong. E-Ray uses different chemistry Pouch Cells and Execs have said a plug in option would be useless for this small battery that says close to the planned max charge range. One GM Exec said if you plugged it in when you pulled into the garage it would be fully charged when you went in the house!***





Mary Barra Announced GM Will Be Spending 35 Billion Through 2025 on Mostly EV and Battery Car and Battery Development and Production.

Next Corvette Model, the C9, will be an EV, IMO. Flagship Promoting EV's to Public

Mary Barra announced GM is accelerating its engineering and capital investments in electric vehicles (EVs) and self-driving technology (AVs) to \$35 billion between 2021 and 2025.

GM will focus on zero-emission, battery-electric vehicles (with some share of hydrogen fuel cell vehicles), *instead of "partial solutions" like hybrids* "electrified" ICE vehicles.

"With our engineering and capital investments, we are executing the industry's most comprehensive and fully integrated EV and AV strategy, underpinned by the Ultium Platform, along with revenue growth opportunities like connected services, HYDROTEC and Super Cruise."

Most of the investments will fall on vehicle plants and four battery plants in the US.

### News From the Government:



WASHINGTON December 2021– In a major step to fight climate change, the Biden administration is raising vehicle mileage standards to significantly reduce emissions of planet-warming greenhouse gases, reversing a Trump-era rollback that loosened fuel efficiency standards. A final rule issued Dec. 20 would raise mileage standards starting in the 2023 model year, reaching a projected industry-wide target of 40 miles per gallon by 2026. The new standard is 25% higher than a rule finalized by the Trump administration last year and 5% higher than a proposal by the Environmental Protection Agency in August.

"We are setting robust and rigorous standards that will aggressively reduce the pollution that is harming people and our planet – and save families money at the same time," EPA Administrator Michael Regan said. (*Regan's probably wearing Mask to hide big smile.*) Details to come.

**Washington, April 1<sup>st</sup>, 2022**

***49 MPG Fuel-Economy Standard  
Ordered for Cars by 2026***

The Biden administration ordered carmakers to increase their average fuel economy to about 49 mpg by 2026, in an ambitious effort to make up for progress stalled when President Donald Trump rolled back the efficiency program.

The new fuel economy rules, issued April 1 by the National Highway Traffic Safety Administration, require carmakers to heighten the fuel efficiency of their fleets by 8% annually for the 2024 and 2025 model years, and 10% for 2026, according to a senior administration official. The agency was facing a March 31 deadline to finalize new rules for the 2024 model year.

*Biden Laughing as he can now blame Russia and he won't have to raise Federal Gas tax.*

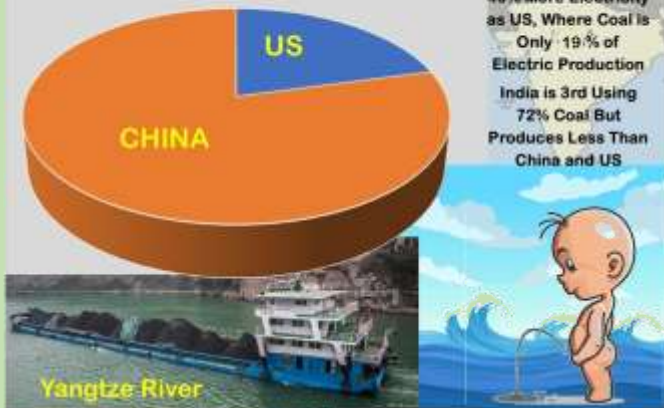


Putting the new numbers in perspective: The EPA reported in November 2021 that carmakers achieved an average of 25.4 mpg for vehicles made in 2020.

That was 0.5 mpg higher than the 2019 model year and a record high, but a far cry from the 49 mpg by 2026 that President Joe Biden's is now proposing.

In real world mpg terms, 39 mpg is what is estimated 49 mpg EPA values will achieve.

**Electricity Produced by Coal**



**The Future- Who Knows?**

My issue with the whole foolish, no fossil fuels for US Cars is it's pissing in the World CO<sub>2</sub> ocean. Been on three river cruises to China, SE Asia (just before the pandemic) and in 2022 to Eastern Europe. NO WAY can these folks afford EVs.

In SE Asia they mainly use cheap high polluting motor scooters that burn gasoline. EVs would be a joke. China and India use coal for a majority of their electric power production and will continue. China is building more coal fired plant all the time. They have coal and will use it!

In Europe last year we were at a family home in Croatia. Because of Russian oil and natural gas price increases they planned on using wood to heat their home. All their neighbors had wood piled high in their yards! Emission tests show wood produces 2.5 times more CO<sub>2</sub> than natural gas and 30% more than coal. The US is rapidly replacing coal with natural gas for electric power! We're about 20% coal, 40% natural gas and switching to that 50% lower CO<sub>2</sub> generating source!



2024 CORVETTE E-RAY

BODY STYLE

- Coupe

EXTERIOR COLORS

- PAINT COLOR - Cacti
- ROOF - Body Color

PERFORMANCE/WHEELS

- PACKAGE - ZER Performance Package
- BRAKE CALIPERS - Edge Red
- ALUMINUM - Pearl Nickel

EXTERIOR

- BADGES - Carbon Flash
- EXTERIOR - Black Exhaust Tips

TRIM LEVEL

- TRIM - 3LZ

INTERIOR COLORS

- INTERIOR COLOR - Adrenaline Red Dipped

Ready to get my E-Ray ASAP!

See specs left. The ZER Option is confirmed after the Bash, as only summer tires. No Need for All-Season in NE SC and want the 1.1 lateral "g" versus 1.0 probably mean. Have switched to Artemis interior once actual pics were available.

Had planned on the Ground Effects Option BUT It only includes a CF splitter, not longer side skirts. In our area a CF splitter needs a Lift. There are inexpensive copies for the C8 Z06 made from ABS. Will consider and see what I can add for extended side skirts to stop rocks hitting the rockers.










## “60” C8, 2017 Grand Sport & 2014 Z51 Stingray Mods or Info Available As PDFs:
















60 PDFs discuss improvements or info about a C8, 2017 Grand Sport, 2014 Z51 Stingray function and/or esthetics. Some are minor and others, like the installing “Low Dust Brake Pads” on C8 & C7s, have detailed information.

Below are the PDF's available. Click on picture or Blue PDF link or copy and paste the PDF link (Blue type) into your browser. Or email me at [GUtrachi@aol.com](mailto:GUtrachi@aol.com) and state the title desired, shown in Yellow:

<b>C8 Install High Wing</b> <i>How To Remove Rear Bumper- Install Wing</i> <a href="http://netwelding.com/C8_High_Wing.pdf">http://netwelding.com/C8_High_Wing.pdf</a>	
<b>C8 Bigger Brakes</b> <i>C8 Brakes Are Anemic Compared to Other MEs</i> <a href="http://netwelding.com/C8_Big_Brakes.pdf">http://netwelding.com/C8_Big_Brakes.pdf</a>	
<b>C8 PDR SD Card Selection</b> <i>Things to Consider When Buying SD Card</i> <a href="http://netwelding.com/PDR_SD_Card.pdf">http://netwelding.com/PDR_SD_Card.pdf</a>	
<b>C8, C7 eLSD vs Positraction</b> <i>eLSD is a Modern Dif; Positraction is from 1960s</i> <a href="http://netwelding.com/eLSD_VS_Pos.pdf">http://netwelding.com/eLSD_VS_Pos.pdf</a>	
<b>C8 FWD Hybrid</b> <i>WFWD Hybrid Provides More Power &amp; MPG</i> <a href="http://netwelding.com/C8_FWD_Hybrid.pdf">http://netwelding.com/C8_FWD_Hybrid.pdf</a>	
<b>C8 Edge Red Engine Cover</b> <i>Engine Cover Matches Valve Covers</i> <a href="http://netwelding.com/Engine_Cover.pdf">http://netwelding.com/Engine_Cover.pdf</a>	
<b>C8 Engine Compartment Lights</b> <i>Multicolor Lights Remote operated</i> <a href="http://netwelding.com/Engine_Lights.pdf">http://netwelding.com/Engine_Lights.pdf</a>	

<p><b>C8 Side Skirts &amp; Splitter</b>  <i>Install C7 Carbon side skirts &amp; splitter on C8</i>  <a href="http://netwelding.com/Side_Skirts.pdf">http://netwelding.com/Side_Skirts.pdf</a></p>	
<p><b>C8 Z51, GS/C7 Z51 Ceramic Brake Pads</b>  <i>Performance Vettes have dusty brakes. These help!</i>  <a href="http://netwelding.com/Ceramic_Pads.pdf">http://netwelding.com/Ceramic_Pads.pdf</a></p>	
<p><b>C8 Low Restriction Air Intake</b>  <i>Low Restriction Air Filter Why &amp; How To</i>  <a href="http://netwelding.com/C8_Air_Intake.pdf">http://netwelding.com/C8_Air_Intake.pdf</a></p>	
<p><b>C8 &amp; C7 Splitter &amp; C8 Condenser Mesh</b>  <i>Mesh Protects AC Condenser &amp; Splitter Install</i>  <a href="http://netwelding.com/CF_Splitter.pdf">http://netwelding.com/CF_Splitter.pdf</a></p>	
<p><b>C8 NAV SD Card Removed Error</b>  <i>Error When SD Card and Reader Are Fine</i>  <a href="http://netwelding.com/NAV_SD_Card.pdf">http://netwelding.com/NAV_SD_Card.pdf</a></p>	
<p><b>C8/GS/C7 Splash Guards</b>  <i>GM splash guards. ACS Best Front Guards for GS.</i>  <a href="http://netwelding.com/Splash_Guard.pdf">http://netwelding.com/Splash_Guard.pdf</a></p>	
<p><b>Jacking a C8/GS/C7 Vette</b>  <i>Safely jacking either front only or back &amp; front</i>  <a href="http://netwelding.com/Jacking_A_C7.pdf">http://netwelding.com/Jacking_A_C7.pdf</a></p>	
<p><b>C8 &amp; C7 Plates &amp; Frame;</b>  <i>Must Meet South Carolina Law</i>  <a href="http://netwelding.com/License_Plate_Frame.pdf">http://netwelding.com/License_Plate_Frame.pdf</a></p>	
<p><b>Change GS/C7 Oil</b>  <i>WHY change your own oil and C7 Lifting Methods</i>  <a href="http://netwelding.com/Changing_Oil.pdf">http://netwelding.com/Changing_Oil.pdf</a></p>	
<p><b>C8/GS/C7 Mirror Proximity Alarm</b>  <i>Limit switch alarm warns when close to door frame</i>  <a href="http://netwelding.com/Mirror_Proximity_Alarm.pdf">http://netwelding.com/Mirror_Proximity_Alarm.pdf</a></p>	
<p><b>Jacking Pads for C8/GS/C7</b>  <i>Manual says Jacking Pads 2 1/2-inch max OD..</i>  <a href="http://netwelding.com/Jacking_pads.pdf">http://netwelding.com/Jacking_pads.pdf</a></p>	
<p><b>C8/GS/C7 Radar Power</b>  <i>For C7 tapped rear fuse panel. For GS tapped mirror</i>  <a href="http://netwelding.com/Radar_Detector_Power.pdf">http://netwelding.com/Radar_Detector_Power.pdf</a></p>	
<p><b>C8 &amp; C7 Wheel Chatter/Hop</b>  <i>Why sharp, low speed turns with cold tires causes the front tires to chatter/hop.</i>  <a href="http://netwelding.com/Wheel_Chatter.pdf">http://netwelding.com/Wheel_Chatter.pdf</a></p>	
<p><b>C8/GS/C7 Wheel Locks</b>  <i>Wheel locks, help protect your expensive wheels.</i>  <a href="http://netwelding.com/Wheel_Locks.pdf">http://netwelding.com/Wheel_Locks.pdf</a></p>	

<p><b>Deer Whistle Installed on C8/GS/C7</b>  <i>Do they work? Plus Install Info</i>  <a href="http://netwelding.com/Deer_Whistle.pdf">http://netwelding.com/Deer_Whistle.pdf</a></p>	
<p><b>C8 &amp; C7 Splitter Protector</b>  <i>Scrape Armor Protection for Splitter</i>  <a href="http://netwelding.com/Splitter_Protectors.pdf">http://netwelding.com/Splitter_Protectors.pdf</a></p>	
<p><b>C8 &amp; C7 Cargo Area</b>  <i>Rear cargo area storage device and rear protector</i>  <a href="http://netwelding.com/Rear_Cargo_Area.pdf">http://netwelding.com/Rear_Cargo_Area.pdf</a></p>	
<p><b>C8 Coilover Tower Covers</b>  <i>Prevent water from filling Cast aluminum cavities</i>  <a href="http://netwelding.com/Tower_Covers.pdf">http://netwelding.com/Tower_Covers.pdf</a></p>	
<p><b>C8.R Info &amp; GS Rear Diffuser (Fits Any C7)</b>  <i>Rear Carbon Flash Composite Diffuser</i>  <a href="http://netwelding.com/Rear_Diffuser.pdf">http://netwelding.com/Rear_Diffuser.pdf</a></p>	
<p><b>GS/C7 Belt Rattle</b>  <i>Passenger seat belt rattles against the seat back.</i>  <a href="http://netwelding.com/Eliminate_Rattle.pdf">http://netwelding.com/Eliminate_Rattle.pdf</a></p>	
<p><b>Aluminum C7 Chassis and Weld Repair</b>  <i>The C7 aluminum chassis. Includes weld repair info.</i>  <a href="http://netwelding.com/Aluminum_Chassis.pdf">http://netwelding.com/Aluminum_Chassis.pdf</a></p>	
<p><b>Manage GS/C7 Spilled Gas &amp; Door Lock</b>  <i>Protect when filling gas. Preventing door lock failure.</i>  <a href="http://netwelding.com/Manage_Spilled_Gas.pdf">http://netwelding.com/Manage_Spilled_Gas.pdf</a></p>	
<p><b>GS/C7 License Plate &amp; Cargo Lights</b>  <i>LED license plate light &amp; cargo area bulbs</i>  <a href="http://netwelding.com/License_Plate_Light.pdf">http://netwelding.com/License_Plate_Light.pdf</a></p>	
<p><b>GS/C7 Door Panel Protector</b>  <i>Black plastic protector prevents scuffing of door</i>  <a href="http://netwelding.com/Door_Panel_Protector.pdf">http://netwelding.com/Door_Panel_Protector.pdf</a></p>	
<p><b>GS/C7 Improved Cup Holder</b>  <i>A solution to the cup holder spilling</i>  <a href="http://netwelding.com/Improved_cup_Holder.pdf">http://netwelding.com/Improved_cup_Holder.pdf</a></p>	
<p><b>C7 Carbon Fiber Grille Bar</b>  <i>Install genuine carbon fiber grille bar overlay</i>  <a href="http://netwelding.com/CF_Grille_Bar.pdf">http://netwelding.com/CF_Grille_Bar.pdf</a></p>	
<p><b>Replacing C7 Battery</b>  <i>Tricks for installing battery!</i>  <a href="http://netwelding.com/Battery_Issues.pdf">http://netwelding.com/Battery_Issues.pdf</a></p>	



### **GS/C7 Window Valet**

*Lower Windows With FOB Helps Latch Hatch*

[http://netwelding.com/Hatch\\_Latch.pdf](http://netwelding.com/Hatch_Latch.pdf)



### **GS/C7 Blind Spot Mirror**

*Smaller rear and side windows cause C7 blind spots. Small "blind spot mirrors" help*

[http://netwelding.com/Blind\\_Spot.pdf](http://netwelding.com/Blind_Spot.pdf)



### **GS/C7 Skid Pad Protector**

*After the air dam, the aluminum "skid pad" hits*

[http://netwelding.com/Skid\\_Pad\\_Protector.pdf](http://netwelding.com/Skid_Pad_Protector.pdf)



### **GS/C7 OnStar Lights**

*Rear view mirror OnStar LED's, at a quick glance, look like a police car flashing light! This is a fix.*

[http://netwelding.com/OnStar\\_Lights.pdf](http://netwelding.com/OnStar_Lights.pdf)



### **GS/C7 Skip Shift Eliminator**

*Skip Shift Eliminator install*

[http://netwelding.com/Skip\\_shift\\_Eliminator.pdf](http://netwelding.com/Skip_shift_Eliminator.pdf)



### **GS/C7 Catch Can & Clean Oil Separator**

*What is Coking and how to reduce the potential*

[http://netwelding.com/Catch\\_Can.pdf](http://netwelding.com/Catch_Can.pdf)



### **GS MGW Flat Stick Shifter**

*The MGW shifter shortens throw and is more precise*

[http://netwelding.com/MGW\\_Shifter.pdf](http://netwelding.com/MGW_Shifter.pdf)



### **GS/C7 Round Shift Knob**

*A round shift knob shortens throw on OEM shifter*

[http://netwelding.com/Shift\\_Knob.pdf](http://netwelding.com/Shift_Knob.pdf)



### **GS/C7 Stingray Sill Plate**

*Stingray sill plate replaces original.*

[http://netwelding.com/Sill\\_Plate.pdf](http://netwelding.com/Sill_Plate.pdf)



### **GS/C7 Nylon Bra**

*Nylon Bra Stops Bugs. Fits with Stage 3 Winglets*

[http://netwelding.com/Nylon\\_Bra.pdf](http://netwelding.com/Nylon_Bra.pdf)



### **GS/C7 Clutch Fluid Change**

*Clutch fluid after 3000 miles gets dirty*

[http://netwelding.com/Clutch\\_Fluid.pdf](http://netwelding.com/Clutch_Fluid.pdf)



### **C7 Carbon Fiber Hood Vent**

*Replaces Plastic Hood Vent*

[http://netwelding.com/Hood\\_Vent.pdf](http://netwelding.com/Hood_Vent.pdf)



### **GS/C7 Cold Air Intake**

*Low Restriction Air Filter & Duct*

[http://netwelding.com/Cold\\_Air\\_Intake.pdf](http://netwelding.com/Cold_Air_Intake.pdf)



### **GS/C7 Soler Modified Throttle Body**

*For Improved Throttle Response*

[http://netwelding.com/Soler\\_Mod\\_TB.pdf](http://netwelding.com/Soler_Mod_TB.pdf)



<p><b>Garmin GPS for GS Cubby</b>  <i>Garmin Mounts in GS Cubby &amp; Apple CARPLAY</i>  <a href="http://netwelding.com/GPS_In_Cubby.pdf">http://netwelding.com/GPS_In_Cubby.pdf</a></p>	
<p><b>GS Splitter Stage 3 Winglet</b>  <i>Stage 3 Winglets Integrate with Spats</i>  <a href="http://netwelding.com/Stage_3_Winglets.pdf">http://netwelding.com/Stage_3_Winglets.pdf</a></p>	
<p><b>C7 Removing GM Plastic Film</b>  <i>How To Remove The Rocker Panel Film</i>  <a href="http://netwelding.com/Rocker_Panel_Film.pdf">http://netwelding.com/Rocker_Panel_Film.pdf</a></p>	
<p><b>GS 2LT to 2.5 LT</b>  <i>Red Upper Dash Pad Like 3LT</i>  <a href="http://netwelding.com/Red_Dash_Pad.pdf">http://netwelding.com/Red_Dash_Pad.pdf</a></p>	
<p><b>Jake Emblem/Decals for GS</b>  <i>Jake Symbols Support GS Racing Image</i>  <a href="http://netwelding.com/Jake_Embles.pdf">http://netwelding.com/Jake_Embles.pdf</a></p>	
<p><b>Rusty GS/C7 Muffler</b>  <i>Why the C7 muffler rusts way to turn matte black.</i>  <a href="http://netwelding.com/Muffler_Rust.pdf">http://netwelding.com/Muffler_Rust.pdf</a></p>	
<p><b>GS Engine Compartment Mods</b>  <i>Cosmetic Additions in Engine Compartment</i>  <a href="http://netwelding.com/Engine_Compartment.pdf">http://netwelding.com/Engine_Compartment.pdf</a></p>	
<p><b>GS Vitesse Throttle Controller: Fits All C7s</b>  <i>Adjustable Throttle-by-Wire Control</i>  <a href="http://netwelding.com/Throttle_Control.pdf">http://netwelding.com/Throttle_Control.pdf</a></p>	
<p><b>Boomy Bass Solution</b>  <i>Use Presets to Adjust Bass etc. Tone/Balance</i>  <a href="http://netwelding.com/Boomy_Bass">http://netwelding.com/Boomy_Bass</a></p>	
<p><b>GS/C7 Air Dam, Functions</b>  <i>Why Missing from Z51, Some GS &amp; Z06</i>  <a href="http://netwelding.com/Air_Dam.pdf">http://netwelding.com/Air_Dam.pdf</a></p>	
<p><b>Rusty GS/C7 Muffler</b>  <i>Why the C7 muffler rusts way to turn matte black.</i>  <a href="http://netwelding.com/Muffler_Rust.pdf">http://netwelding.com/Muffler_Rust.pdf</a></p>	
<p><b>Engineering a ProStreet Rod</b>  <i>How Our '34 ProStreet Rod Was Designed and Built</i>  <a href="http://netwelding.com/Engineering%20Street%20Rod%203-08.pdf">http://netwelding.com/Engineering%20Street%20Rod%203-08.pdf</a></p>	
<p><b>Motorsports Welding Article</b>  <i>Wrote Article on NHRA and NASCAR Chassis Design</i>  <a href="http://netwelding.com/Motorsports_Welding_2018.pdf">http://netwelding.com/Motorsports_Welding_2018.pdf</a></p>	