

EVs, Late Fall, 2022

By John Benson

December 2022

1. Introduction

My last post similar to this one was in late-October (see below), and I'm planning to post this one in mid-December.

EVs-Mid Fall, 2022: *This Post looked at various future mainstream EVs plus went up-market (to the heavies) and down-market (to the tiny, hyper-efficient EVs). Also, we looked at some early payoff from the Inflation Reduction Act of 2022 (IRA), as EV manufacturers started expanding their U.S. facilities to take advantage of the IRA's tax credits and thus boost their volumes. Finally we looked at Tesla's Third Quarter Results and Earnings Call.*

<https://energycentral.com/c/ec/evs-mid-fall-2022>

In this paper we will deal with manufacturing commitments, market position, significant awards, new deliveries and needed changes among six manufacturers. In the Technology section (3) are an explanation of electric vehicle (EV) reliability issues, and a major advance in vehicle-to-grid (V2G) technology.

2. Manufacturing

2.1. BMW

The BMW Group continues the roll-out of its electro-mobility plan with a new investment in the U.S. to expand Plant Spartanburg and the company's manufacturing footprint in the U.S. BMW Group Chairman of the Board of Management, Oliver Zipse, announced today a \$1.7 billion investment in its U.S. operations, including \$1 billion to prepare for the production of electric vehicles at the company's existing U.S. manufacturing facility in South Carolina, and \$700 million to build a new high-voltage battery assembly facility in nearby Woodruff, SC. By 2030 BMW Group will build at least six fully electric models in the U.S...¹

Zipse also announced an agreement to source next generation lithium-ion battery cells from Envision AESC, which will build a new plant in the state.

"For decades, Plant Spartanburg has been a cornerstone of the global success of the BMW Group. It is the home of the BMW X models that are so popular all over the world. Going forward, it will also be a major driver for our electrification strategy, and we will produce at least six fully electric BMW X models here by 2030. That means: The 'Home of the X' is also becoming the 'Home of the Battery Electric Vehicle'," said Zipse on Wednesday. "In addition, we can showcase BMW Group's 'local for local' principle: Our

¹ Phil DiIanni, BMW USA News, "BMW Group Announces \$1.7 Billion (USD) Investment to Build Electric Vehicles in the U.S. and Signs Agreement with Envision AESC for the Supply of Battery Cells to Plant Spartanburg," Oct 19, 2022, https://www.bmwusanews.com/newsrelease.do?id=4047&mid=&utm_source=newsletter&utm_medium=email&utm_campaign=currentclimate&cdclid=628673ca6e1a1d1211f1d747

newly developed sixth generation battery cells, which were specifically designed for the next generation electric vehicles, will be sourced here in South Carolina – where X goes electric...”

In line with the principle of "local for local," the BMW Group aims to purchase battery cells for its electric vehicles where production takes place. The company has found a partner in Envision AESC, which will build a new battery cell factory in South Carolina, to supply Plant Spartanburg. Envision will produce newly developed round lithium-ion battery cells, which were specifically designed for the sixth generation of BMW eDrive technology and will be used in the next generation electric vehicles. The annual capacity of the battery cell factory will be up to 30 GWh.

The new battery format will increase energy density by more than 20 percent, improve charging speed by up to 30 percent and enhance range by up to 30 percent. At the same time, CO₂ emissions from cell production will be reduced by up to 60 percent through the partial use of secondary lithium, cobalt, and nickel material, as well as renewable energy for production.

Author's comment: I believe the above text, "...use of secondary lithium, cobalt, and nickel material," refers to material that comes from recycling.

The cooperation with Envision AESC is an important step in the BMW Group's plan to strengthen its regional supply chains. The expansion of electric vehicle production in combination with a local battery cell factory will lead to the creation of new supply chains, new networks for sub-suppliers, and new jobs throughout the entire region...

Of the new \$1.7 billion investment announced today, \$700 million will be used to build a new high-voltage BMW battery assembly center in Woodruff, SC, near Plant Spartanburg. The new facility will encompass over 1 million sq. ft. and produce next generation batteries for fully electric vehicles, and 300 new jobs will be created on site.

Plant Spartanburg currently produces lithium-ion battery modules for the two plug-in hybrid electric vehicles built at the plant, the BMW X3 xDrive30e and BMW X5 xDrive45e. In 2021, nearly 70,000 electrified BMWs were built on site. The site in Woodruff will also leverage the experience and expertise developed in Plant Spartanburg's existing operations at the new facility...

Plant Spartanburg was established 30 years ago and began producing vehicles two years later. Since then, the plant has become the global center of competence for BMW Sports Activity Vehicles and a critical component of the company's global production network. The plant currently represents an investment of nearly \$12 billion, employs more than 11,000, and has an annual capacity of up to 450,000 vehicles. To date more than six million BMW vehicles have been built in the U.S. – for the U.S. and global markets. Based on this strength, BMW has been the largest automotive exporter from the U.S. by value for the past eight years.

Plant Spartanburg currently produces 11 models including the BMW X3, X4, X5, X6 and X7 Sports Activity Vehicles, four BMW M models and two plug-in hybrid electric models. Production of the all-new hybrid-electric BMW XM will begin later this year.

The plant is supported by more than 300 suppliers in the U.S., including over 40 direct tier 1 suppliers in South Carolina alone...

In addition to sales and marketing operations, the BMW Group footprint in the U.S. consists of nearly 30 locations in 12 different states, including an advanced design studio, a technology research and development center, and a venture capital fund in California, BMW Group Financial Services, and BMW Manufacturing Corporation, which operates Plant Spartanburg in South Carolina. The BMW Group dealer network consists of nearly 650 independently owned BMW, MINI, Rolls-Royce and BMW Motorrad dealers nationwide. Taken together, the BMW Group's operations in the U.S. directly and indirectly provide and support more than 120,000 jobs in the U.S. and has contributed \$43.3 billion to the U.S. economy...

2.2. Tesla

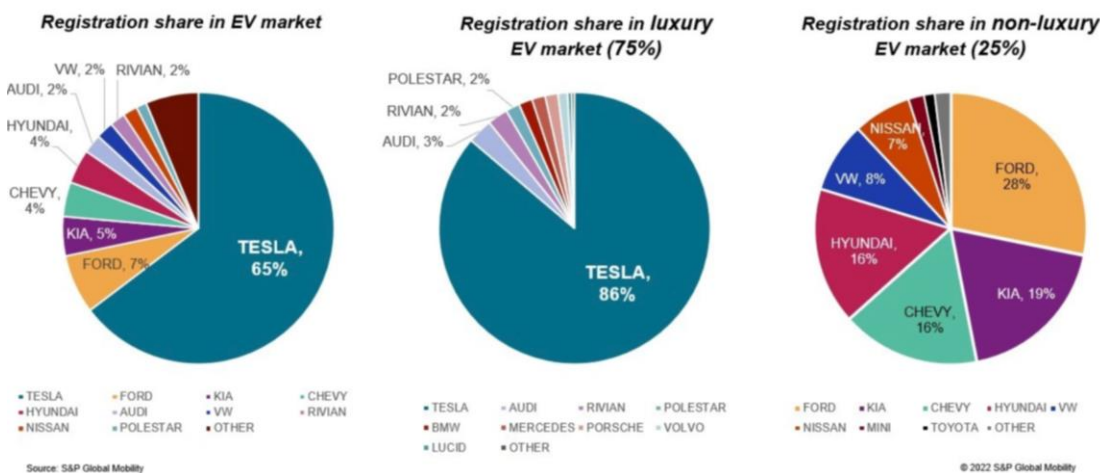
S&P Global Mobility released new EV sale data that show Tesla still owns the US EV market, but it is losing market share.²

But when you had 100% of the market, there's only one way, and that's down.

For years now, Tesla has dominated the electric auto market in its home country. It is expected that Tesla's hold on the market will erode as more EV options hit and help grow the US market, but for now, the US EV market is still extremely dependent on Tesla's production and deliveries.

For the entire year of 2020, Tesla vehicles accounted for 79% of new electric vehicles registered in the United States. In 2021, that number went down to 69.95%, but that's still impressive with EV delivery volumes significantly increasing throughout the year along with Tesla's prices.

Now in 2022, new data released by S&P Global Mobility today shows that Tesla still dominates with 65% of market share this year through the first nine months:



Out of the more than 525,000 EVs registered over the first nine months of 2022 in the US, nearly 340,000 were Tesla vehicles.

When you look into the luxury EV market (over \$50,000), Tesla's dominance is even clearer with 85% market shares.

² Fred Lambert, Electrek, "Tesla still owns US EV market but is losing market share, shows new data," Nov 29, 2022, <https://electrek.co/2022/11/29/tesla-owns-us-ev-market-but-losing-market-shares-data/>

S&P Global Mobility predicts that the number of EV models available in the US will grow from 48 at present to 159 by 2025.

Tesla is expected to only contribute a single additional vehicle, the Cybertruck, to those 100+ new EV models, but S&P says that it will still only marginally affect Tesla, which is expected to still grow its volume during that time.

However, some of those new EV models from other automakers are expected to reach high-volume production within the next three years and start challenging Tesla's dominance in the US...

Author's comment: Note that Tesla is no longer a player in the sub-\$50K (non-luxury) EV market, but completely dominates the luxury market. This is in spite of the fact that many of the recent EV market entrants came from this segment in the non-EV light vehicle market, or are a new entrant with only luxury vehicles (like Rivian).

From *EVs-Mid Fall, 2022*, linked in the Intro note that Tesla had very good 3rd quarter earnings (...*earnings per share of \$1.05 (Non-GAAP versus \$1.00 expected by Wall Street)*). Thus they have the flexibility to maintain or reduce their margins as their volume grows via the ongoing Giga Austin ramp. Also see highlighted Toyota comments below.

2.2.1. Tesla Production Semi First Deliveries

As I'm about a week away from posting this, the following article came across the Web.

Tesla CEO Elon Musk kicked off deliveries of the company's first few production Semi trucks on Thursday, speaking on stage at the company's factory in Sparks, Nevada, with Dan Priestly, the company's senior manager for Semi truck engineering.³

As CNBC previously reported, Tesla set up lines and started production of the Semi outside of Reno this year at the site where it primarily makes the battery cells, drive units, and battery packs that power its cars. Musk and Tesla did not say on Thursday how many Semis it is delivering...

Author's comment: to avoid confusion, I believe that the initial Semi production line is in Tesla's "...low-volume Tesla Semi production line in a new building in the industrial park where the Nevada Gigafactory is located..." There are more details on this facility in section 4.2 of the post from summer of 2021 linked below. The NV Gigafactory is where battery cells are being made.

<https://energycentral.com/c/ec/tesla-2021-update>

One major difference between Tesla's Class 8 offering and other heavy-duty trucks is the location of the steering wheel and the driver's seat. Rather than using the left side (or right side in Europe), Tesla designed the Semi with the steering wheel in the center of the cab with touchscreens positioned on both sides of the driver.

While the Tesla Semi was in development, other fully electric heavy-duty trucks launched into the market. Volvo-owned Renault Trucks and Daimler have produced and delivered electric heavy-duty trucks to customers before Tesla. Even beleaguered

³ Lora Kolodny, CNBC, "Tesla CEO Elon Musk kicks off first Semi truck deliveries," Dec 1 2022, <https://www.cnbc.com/2022/12/01/tesla-ceo-elon-musk-kicks-off-semi-truck-deliveries.html>

Nikola, whose founder was ousted and convicted of fraud in recent months, started production of a battery electric truck in March.

But Tesla boasts some high-tech features not available elsewhere, including a new, fast-charging system, and a battery with greater range than competitors. The DC fast-charging system delivers up to 1MW, and employs a water-based coolant to ensure it's safe in delivering that power. Tesla says that the Semi can travel 500 miles on a single charge while fully loaded.

Author's comments: All of the above earlier deliveries by other manufacturers except Nikola are modified internal combustion trucks, not designed from the ground-up to be EVs like the Tesla Semi.

Initial deliveries will be to PepsiCo / Frito/Lay facilities in California. Tesla has already installed some of his new 1 MW "Semi Chargers" there as reported earlier.

2.3. Toyota

The Toyota bZ4X and Subaru Solterra are distinctly different vehicles, but both use the same dedicated EV Platform. One decision Toyota made in developing the bZ4X is to allow it to be built on the same assembly line as internal combustion vehicles. It turns out this was a big mistake.⁴

Toyota is struggling with its shift to electric vehicles, and it is reportedly considering major changes in its EV plans driven by Tesla's manufacturing strategy.⁵

However, it may slow down some of its existing electric vehicle programs.

For years, we have been reporting on how Toyota has been lagging behind the competition in the shift to battery-powered electric vehicles. The automaker has been known for investing in hydrogen fuel cell and hybrid vehicles instead.

Toyota has continued to be highly critical of going all-in in battery-electric vehicles despite announcing its own plan last year to bring 30 battery EV models to market by 2030. The plan is only a year old, at least publicly, and yet, Toyota is reportedly considering a major overhaul of its EV plan.

Reuters reported today:

Toyota is considering a reboot of its electric-car strategy to better compete in a booming market it has been slow to enter, and has halted some work on existing EV projects, four people with knowledge of the still-developing plans said.

Toyota reportedly has a working group evaluating significant changes to its EV platforms that will revamp its EV plan.

A decision is to be made early next year, and work is reportedly stopping on some EV programs in the meantime.

⁴ See "EVs - Early Summer, 2022," section 3 for more information on these designs, <https://energycentral.com/c/ec/evs-early-summer-2022>

⁵ Fred Lambert, Electrek, "Toyota struggles with EV shift, considers changing plans due to Tesla," Oct 24, 2022, <https://electrek.co/2022/10/24/toyota-struggles-ev-shift-changing-plans-due-tesla/>

Toyota didn't confirm or deny Reuters' report, but it did comment:

In order to achieve carbon neutrality, Toyota's own technology – as well as the work we are doing with a range of partners and suppliers – is essential.

According to the report, the review of Toyota's EV plan, which is led by Shigeki Terashiwas, was triggered in part by Tesla "winning the factory cost wars on EVs."

Toyota was reportedly surprised by the successful use of some manufacturing technology by Tesla, including the "giga press" that is enabling the Texas-based automaker to produce larger casting parts. It leads to manufacturing efficiency.

One of the Toyota sources in the report said:

What's driving Mr. Terashi's effort is the EV's faster-than-anticipated takeoff and rapid-fire adoptions of cutting-edge innovations by Tesla and others.

Toyota has been seen as a leader in manufacturing in the auto industry. While Tesla's manufacturing has been criticized in the past, in the EV shift, there's no denying that the company is emerging as a leader.

Tesla now has the capacity to produce millions of long-range electric vehicles, and it does it with an industry-leading gross margin.

According to the report, Toyota is taking notes and looking to potentially develop a new EV platform from the ground up based on those notes.

On top of the Tesla inspiration, Toyota is also inspired to change EV plans due to the lack of success with its own lone battery-electric vehicle program in the US.

Toyota had to stop selling the bZ4X electric SUV because it was plagued by some bad recalls.

Some good and some bad here. I often say that other automakers, even well-established ones like Toyota, should look at Tesla's success in mass-producing electric vehicles.

If Toyota is finally doing that and improving its own EV platform, that's good...

2.4. Hyundai

Hyundai Motor Group (the Group) today announced it has entered into an agreement with the State of Georgia to build its first dedicated full electric vehicle and battery manufacturing facilities in the U.S.⁶

The Group's U.S. investment decision will support its goal of becoming a leader in electric mobility in the U.S. market. It also highlights the Group's commitment to sustainability through electrification and to supporting the economies where it operates...

⁶ Hyundai press release, "Hyundai Motor Group to Establish First dedicated EV Plant and Battery Manufacturing Facility in the U.S.," May 20, 2022, <https://www.hyundai.com/worldwide/en/company/newsroom/hyundai-motor-group-to-establish-first-dedicated-ev-plant-and-battery-manufacturing-facility-in-the-u.s.-0000016837>

The official signing ceremony was held in Bryan County, attended by Georgia Governor Brian P. Kemp and other Georgia officials...

“The future of transportation is in the Peach State as we announce the largest project in our state’s history – delivering high-quality jobs on the leading edge of mobility to hardworking Georgians,” said Governor Brian Kemp. “Not only are we thrilled to welcome Hyundai to Georgia’s coastal region, but it’s incredible that within a year of Georgia’s investment in the Bryan County Megasite, we are locating a world-class project here with a company with great Georgia history!”

The new EV plant and battery manufacturing facilities represent an investment of approximately USD 5.54 billion. The new facility will break ground in early 2023 and is expected to begin commercial production in the first half of 2025 with an annual capacity of 300,000 units. The battery manufacturing facility will be established through a strategic partnership, which the details will be disclosed at a later stage...

The Group plans to produce wide range of full electric vehicles for U.S. customers at the new Georgia EV plant. Details of production models will be shared at later dates. The local EV production will increase U.S. consumer accessibility to the Group’s innovative EVs. Through the battery manufacturing facility, the Group also aims to establish a stable supply chain and build a healthy EV ecosystem in the U.S.

The EV and battery manufacturing plant will be located on a dedicated 2,923-acre site in Bryan County Georgia, with immediate access to I-95 and I-16 highways which creates easy access to 250 major metro areas. It is less than 50 kilometers from the Port of Savannah, the single-largest and fastest-growing container terminal in the U.S. with two Class I rail facilities on-site provided by Georgia Central Railway. West Point, Georgia is already home to the Group’s Kia manufacturing hub in the US.

Hyundai Motor Group selected Georgia as the Group’s EV and battery production site due to a range of favorable business conditions, including speed-to-market, talented workforce, as well as existing network of the Group affiliates and suppliers...

The EV plant investment comes as a part of the Group’s 2021 announcement to invest USD 7.4 billion by 2025 to foster future mobility in the U.S., including production of EVs and offering smart mobility solutions...

The Group is accelerating its electrification efforts with the global target to sell 3.23 million full electric vehicles annually by 2030. To realize this goal, the Group plans to establish a global EV production network that will ensure a stable supply of EVs around the globe...

With the additional EV and battery production capabilities in the U.S., the Group aims to become one of the top three EV providers in the U.S. by 2026. The Group plans to lead the EV market not just in sales, but also in terms of design, technologies, and mobility solutions optimized for electric mobility era.

The investment is in line with the U.S. government’s roadmap to accelerate electrification, as global OEMs are announcing plans to expand their local EV production in the U.S. Last year, the U.S. government announced a new initiative under which sales of zero-emission vehicles should account for at least half of OEM’s new vehicle sales by 2030...

The new plant will boast a highly connected, automated, and flexible manufacturing system, which organically connects all elements of the EV ecosystem to realize customer value.

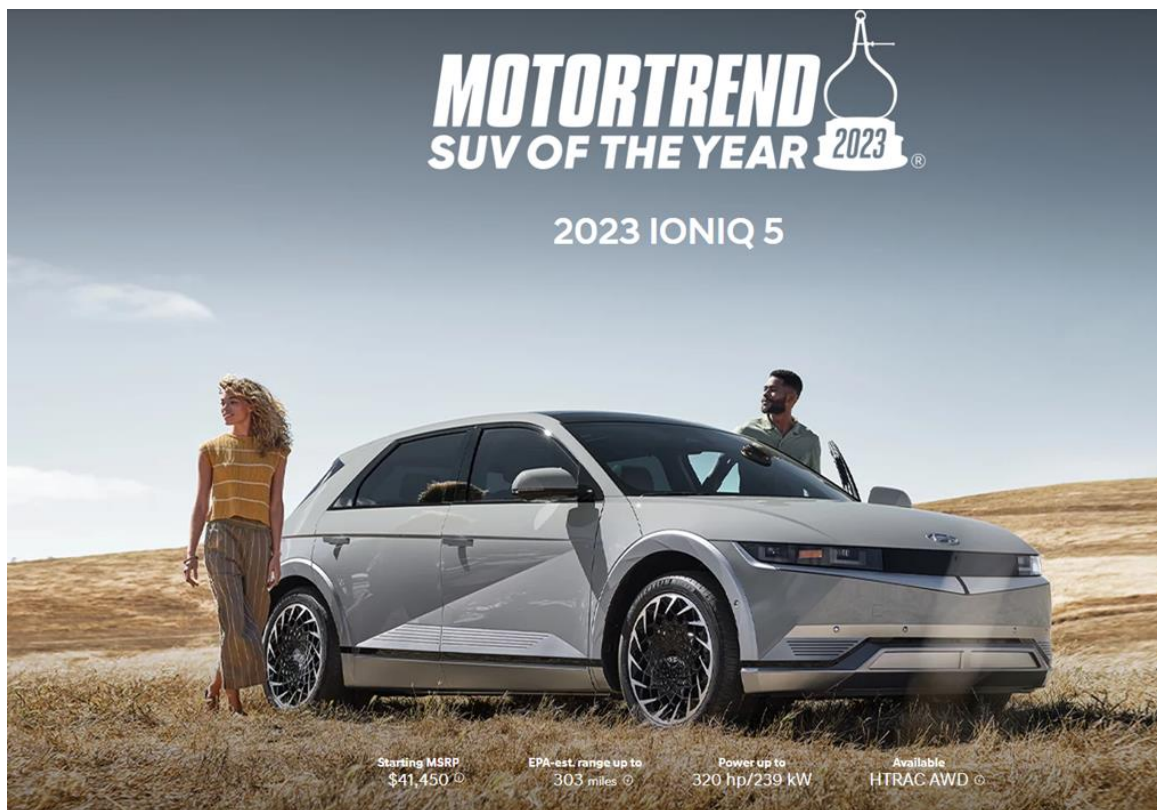
The Group plans to implement many of its advanced intelligent manufacturing technologies that are currently under test at the Group's innovation hub, the Hyundai Motor Group Innovation Center in Singapore (HMGICS).

The Georgia facility will become an intelligent manufacturing plant. All processes of production - order collection, procurement, logistics and production - will be optimized utilizing AI and data. The innovative manufacturing system will also help create a human-centered work environment with robots assisting human workers.

As part of the Group's commitment to sustainability, the plant will mainly rely on renewable energy sources to power the facility and use emission-reduction technologies to meet the RE100 requirements.

2.4.1. 2022 SUV of the Year

Many of you that read my posts on EVs know that Motor Trend is one of my sources. I recently read my latest issue and they announced the winner of their yearly SUV of the Year competition. The Hyundai vehicle pictured below won this award.



Although I briefly covered this model in an earlier issue, I evidently didn't give it enough pixels. The above picture is from the Hyundai site linked below. Note the price.

<https://www.hyundaiusa.com/us/en/vehicles/ioniq-5>

In reading the text from on-line version of Motor Trend (quoted and referenced below, I read the paper version), you can see why this award was a no-brainer. Also it beat all SUVs, including IC-powered, hybrids, and this included quite a few other EVs. Also some of the competitors cost multiples of the Ioniq 5's price.

Credit for the Ioniq 5's success starts with its underpinnings. Like the related Kia EV6 and Genesis GV60, the Ioniq 5 is one of the first vehicles on the manufacturer's cutting-edge E-GMP modular EV platform. Base \$42,745 Ioniq 5s get a 58.0-kWh battery pack paired with a single rear-mounted electric motor, good for 168 hp and 258 lb-ft of torque and an EPA-estimated 220 miles of range. One step up, the \$46,795 SE nets a 77.4-kWh battery pack and optional (\$3,500) dual-motor all-wheel drive. Rear-drive big-battery Ioniq 5s get 225 hp and 258 lb-ft of twist, while all-wheel-drive variants produce a healthy 320 hp and 446 lb-ft. All-wheel-drive 2023 Ioniq 5s can now travel 266 miles per charge, 10 more than before, while the single-motor variant can clear an impressive 303 miles between charges.⁷

Even better, E-GMP is an 800-volt platform, meaning EVs on it are among the few at any price point that can make use of a 350-kW Level 3 DC fast charger. In its current state, the Ioniq 5 can charge from 10 to 80 percent in as little as 18 minutes, but Hyundai says the end goal of its ongoing improvements to the 5 is whittling the time down to that of an average gas-only fuel stop...

3. Technology

3.1. Electric Vehicles Least Reliable Cars?

Electric vehicles are among the least reliable cars and trucks in the automotive industry today, according to Consumer Reports rankings released Tuesday (11/15).⁸

When compared with hybrid and gas-powered cars and trucks, electric vehicles powered entirely by batteries were the worst performing segment, aside from traditional full-size pickup trucks, according to Consumer Reports.

Reliability issues with electric vehicles were expected, since most automakers, with the exception of early EV-leader Tesla, launched fully electric models in recent years, said Jake Fisher, senior director of auto testing at Consumer Reports. He said companies have not had time to iron out issues that impact reliability.

Since electric car buyers tend to be tech-loving early adopters, automakers also pack the models with a host of other features that could also lead to issues.

"The automakers are using EVs as a technological testbed for whatever new technology they want to try out," Fisher told CNBC. "By having all this new technology, there's a lot of potential problems with them."

⁷ Christian Seabaugh, Motor Trend, "The Hyundai Ioniq 5 Is the 2023 MotorTrend SUV of the Year," Oct 20, 2022, <https://www.motortrend.com/news/hyundai-ioniq-5-2023-suv-of-the-year/>

⁸ Michael Wayland and Lora Kolodny, CNBC, "Electric vehicles less reliable because of newer technologies, Consumer Reports finds," Nov 15, 2022, <https://www.cnbc.com/2022/11/15/consumer-reports-new-technologies-make-evs-less-reliable.html#>

Consumer Reports surveyed owners of more than 300,000 vehicles from model years 2000 to 2022 and used that data to make predictions about the reliability of 2023 model year vehicles.

Electric models comprised a bigger portion in the rankings than ever before. State and federal incentives, and new environmental regulations have encouraged greater adoption of fully electric cars in and outside the U.S., in large part to try to reduce air pollution from transportation.

According to the U.S. Environmental Protection Agency, charging a hybrid- or fully-electric vehicle can cause pollution at the power plant, but total emissions from driving the cars are lower than from gasoline-powered cars. Electric vehicles can also become “greener” over time as power supplied from clean or renewable resources like nuclear, solar and wind increases.

The report covers 24 auto brands with an established history. Of the 275 models in the report, only 11 models from seven brands were fully electric vehicles. Owners of more than 2,000 Tesla vehicles were surveyed.

Topping the list of electric vehicles was the Kia EV6, which was considerably above average. At the bottom of the EV reliability rankings was the electric Hyundai Kona.

Author’s comment: Note that the Kona is a converted internal-combustion powered vehicle. It is also one of the lowest-priced EVs.

Fully-electric vehicles, many of which were first released in recent years, comprised a bigger segment of the list this year than ever before, but still only represent a small segment in the market.

Unlike all-electric vehicles, hybrid cars and trucks were among the most reliable in the study. That’s largely because many hybrids, such as the Toyota Prius, have been on the market for years, so automakers have been able to work the problems out of them.

“When you put in new technology, and you try new things, and you deviate from what is proven technology, you’re going to have more problems,” Fisher said.

Topping this year’s reliability list for brands were Toyota, Lexus, BMW, Mazda and Honda – all ranking above average reliability. Seven of the top 10 most reliable brands were from Japanese and Korean automakers. Lincoln is the only domestic brand in this year’s top 10 rankings...

As an overall brand, Tesla moved up four spots in the reliability rankings compared to last year but remained below average. Other brands with lower-than-average reliability included Chevrolet, GMC, Volkswagen, Jeep and Mercedes-Benz.

Fisher said Tesla is a “standout” regarding electric powertrains compared to legacy automakers.

However, Tesla owners continue to report problems with body hardware, paint and trim in their vehicles across all models, according to Steve Elek, program leader for auto data analytics at Consumer Reports.

Elek said that Tesla’s high-end sedan, the Model S, exhibited steering and suspension troubles, and that the Model S and Model Y crossover utility vehicles both continue to have issues with air conditioning and heat systems.

The center touchscreen featured in Tesla vehicles remained problematic in the Tesla Model S and Model Y.

Selling fewer Model X vehicles, which have historically experienced problems, also assisted Tesla’s ranking, Fisher said. Tesla CEO Elon Musk has compared the Model X, an SUV with falcon-wing doors, to a “Faberge egg” due to the relatively high number of parts required to make the car.

The company’s entry-level sedan, the Model 3, was the only Tesla with an average reliability ranking, while the Model S and Model Y ranked below average.

Consumer Reports did not rate the reliability of driver assistance systems such as Tesla’s Autopilot in its analysis.

Author’s comment: Although the above is an excellent article, I feel a need to comment since I’ve argued in the past that EVs should be intrinsically **more** reliable than IC-powered vehicles or hybrids. I will not back away from what I said in the past (see reference at the end of this comment), but I will add the main factors that lead to the CR determination:

- Many new EVs are flooding the market right now from manufacturers that have never built EVs before (see subsection 2.3 above).
- Many of the above vehicles are being built in low volume pre-ramp production.
- I’ve always believed that the most important rule in engineering any product is “Keep it simple, stupid.” Most of the above EVs are targeted at premium market segments (including the Tesla Model S and Model X).
- I’ve frequently said that (1) I do not own an EV, (2) if I felt that needed to buy an EV, I would never buy a Tesla (they are too weird), (3) Include “complex” in “weird.” (4) See the prior bullet.
- However, at least Tesla has focused on reliable core functions (batteries, motors, controls, brakes and suspensions) for their basic models (Model 3 and Model Y).
- The good news with the above article is that the reliability of EVs should steadily improve over time (as it has and will for Tesla).⁹

3.2. Vehicle to Grid

3.2.1. PG&E Establishes First V2G Export Tool

Pacific Gas and Electric Company (PG&E) has received approval to establish the nation’s first “vehicle-to-grid” (V2G) export compensation mechanism for commercial electric vehicle (EV) charging customers in its California service area. The V2G export

⁹ See “Battery Electric Vehicle Reliability & Maintenance,” Jan 2020, <https://energycentral.com/c/ec/battery-electric-vehicle-reliability-maintenance> Keep in mind this paper was posted almost three years ago, and thus some of the information and reference-links are out of date.

rate promotes EV adoption by providing upfront incentives to help commercial customers offset fleet costs and delivers an innovative solution for these vehicles to export power back to support the grid during peak energy demand periods.¹⁰

The groundbreaking settlement agreement with the Vehicle-Grid Integration Council (VGIC), Electrify America LLC and the Public Advocates Office at the California Public Utilities Commission (CPUC) was adopted by the CPUC on Oct. 20, 2022. The rate is expected to increase participation from V2G school buses and other electric vehicles in response to near-real-time grid conditions and will be available to charging equipment paired with stationary energy storage systems, which can support the grid and provide backup power to charge vehicles during grid outages.

More than 420,000 EVs have been sold in PG&E's service area, representing one in six EVs in the country. As large vehicles like school buses and commercial fleets continue to electrify, the opportunity grows for these vehicles to serve as crucial, flexible grid resources to support a more reliable, affordable and efficient energy system. Greater volumes of these vehicles on the road comes at a critical time, as peak energy demand challenges California's grid and novel solutions like V2G emerge.

"The adoption of the nation's first V2G export rate aligns with our core focus of proactively preparing the grid, increasing access to EV infrastructure, and supporting EV adoption through rates, rebates, tools, and education," said Aaron August, PG&E Vice President, Utility Partnerships and Innovation.

This new export rate structure, in the nation's largest EV market, can serve as a guide for additional innovative rate structures across the country. As utility regulators, state agencies and industry partners continue to move forward with policy and market design in this dynamic space, VGIC is committed to advancing the role of smart EV charging and discharging through policy development, education, outreach, and research to support transportation and electric sector decarbonization...

¹⁰ PG&E Corporation, "PG&E to Offer Nation's First Vehicle-To-Grid Export Rate for Commercial Electric Vehicles," Oct 26, 2022, <https://investor.pgecorp.com/news-events/press-releases/press-release-details/2022/PGE-to-Offer-Nations-First-Vehicle-To-Grid-Export-Rate-for-Commercial-Electric-Vehicles/default.aspx>