

# EVs - Early Summer, 2022

By John Benson

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## 1. Introduction

The last post similar to this one is described and linked below.

**EVs, Late Spring, 2022:** *I started collecting information for this post shortly after I completed my last post on this Subject in March. However the one thing that I didn't have is a main theme. In mid-April I found one, or actually decided to continue with one that I started at the beginning of 2022.*

*My theme is the continued staking-out submarkets in the U.S. Electric Vehicle (EV) Market. This is a complex market that includes both the final assemblers of EVs, EV-component manufacturers, and charging infrastructure developers.*

<https://energycentral.com/c/ec/evs-late-spring-2022>

This post will continue to explore the above described theme, and mainly focus of the low end of the EV Market, including exploring how we might get to the title of section 2. Section 3 will look at two mid-range EV crossovers that are emerging from a familiar partnership. The last sections of this post will explore fleet electrification by a major utility and others.

## 2. \$25,000 EV

### 2.1. Already There?

The Nissan Leaf is already to the "\$25K" benchmark, but mostly if you live in California. First of all, the base Leaf has a range of 149 miles. Although this is OK for a "city car," and would actually (barely) be OK for me, I believe a mainstream EV needs to have a range over 200 miles, and there is a version of the Leaf that meets this requirement, The Leaf S Plus, with a 226 mile range. The S Plus has a base price of \$32,600, but there are incentives.<sup>1</sup>

I would get a federal tax credit of \$7,500, and a California cash rebate of \$2,500, thus the net price before Tax and License in California would be \$22,600. However, another must-have for EVs in a home charger. A Juice-Box Level 2 home charging station is around \$700 from Amazon, and you will probably need to spend significantly more to have an electrician install an external 120/240 plug and the Juice Box inside of a large lockable NEMA 3 or 3R box (weather-resistant: protection against weather hazards that include rain, sleet and snow, and to prevent vandalism) near where you park the vehicle (assuming you don't park it in a garage).

Then there are questions regarding the Leaf's battery, and there have been serious issues with this in the past. *If your Nissan LEAF battery does break down within the first*

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<sup>1</sup> Nissan Leaf Website, <https://www.nissanusa.com/vehicles/electric-cars/leaf.html>

*few years of ownership, you aren't totally out of luck. All new EVs sold in the U.S. are covered by a standard 8-year/100,000-mile warranty on the battery pack.<sup>2</sup>*

*This is in addition to Nissan's New Vehicle Limited Warranty, which covers most other vehicle components, but only lasts for 3 years or 36,000 miles. The LEAF also comes with a 5-year/60,000-mile warranty on the powertrain and electric vehicle system.*

*Before relying on your warranty, it's important to understand what is and isn't covered. Nissan's warranty defines capacity loss as having "below 9 bars of capacity (out of 12) as shown on the Nissan LEAF's capacity gauge."*

Also note that the 2022 **Hyundai KONA Electric** (covered briefly in the last EV post linked above in the Intro) has a base price of \$34,000. If we deduct the rebates, and add the other components as above, you will come out in the range of \$25,000. It also has slightly more range than the Leaf, no battery issues that I'm aware of, and Hyundai has a 10-year 100,000 mile warranty on its powertrain, including the battery.

## **2.2. Evolving to a Variety of \$25k EVs**

There was recently an interesting interview with Jim Farley (CEO of Ford), who *thinks the electric vehicle (EV) industry is set for an upcoming price war where automakers will be competing for sales of EVs under \$25,000.<sup>3</sup>*

*Farley made the comments at the Bernstein Strategic Decisions Conference on Wednesday, saying the catalyst for the price war will be costs reductions in building an EV.*

*Farley said it currently costs Ford an extra \$25,000 to build a single Mustang Mach-E compared to a comparable gas-powered Ford Edge SUV. The majority of those extra costs arise from the battery and charger, which Farley says adds \$21,000 alone.*

*However with new and cheaper battery chemistries coming, and as automakers catch up to Tesla and become more proficient in building EVs, those costs will come down in the next few years.*

*It is not just the cost of the battery that cuts into Ford's EV margins compared to Tesla. Farley said the automaker will also need to cut distribution costs (\$2,000 more per vehicle than Tesla), cut down on advertising (currently \$500 to \$600 more per vehicle), make their EVs more aerodynamic so they can use smaller batteries, and to also simplify production.*

Note Mr. Farley's comparisons with Tesla. The minimum price of any new Tesla (Model 3) is in the range of \$47K. And yet Tesla already has most of the components required to make a reasonably profitable \$25K EV, but they currently have no reason to roll this out. They are backordered for all of their existing models, and (one assumes) making comfortable margins on these.

The following are the above low cost Tesla components:

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<sup>2</sup> Nick Versaw, Compare.com, "Everything You Need to Know About the Nissan LEAF Battery," April 2022, <https://www.compare.com/electric-cars/guides/nissan-leaf-battery/>

<sup>3</sup> Darryn John, Drive Tesla Canada, "Ford CEO predicts "huge" EV price war is coming," June 1, 2022, <https://driveteslacanada.ca/news/ford-ceo-predicts-huge-ev-price-war-is-coming/>

- Low-price LFP Batteries (LiFePO<sub>4</sub> or Lithium Iron Phosphate)
- Structural Batteries
- No dealers to take a cut (most of the above \$2,000 distribution costs)
- No paid advertising
- Structural simplification (a single major structural element each in the front and rear. joined by structural battery)
- Assembly optimization in gigafactories.

However, I believe that other optimizations can be made to improve efficiency and further reduce price, including:

- Larger format and thus lighter-weight batteries.
- Better optimized aerodynamics (as suggested by Mr. Farley)
- Replace aluminum components with lower-cost materials (steel, plastics and/or composites).
- Better optimized regenerative braking + lighter hydraulic brakes
- Light-weight axial-flux Motor(s) with a PCB stator
- Simplified designs with just basic (including safety) features

### 3. Major Manufacturers and a Familiar Partnership

Toyota and Subaru are in the process of releasing their first mass-produced EVs to the U.S. Market. This collaboration is not the first time these two major auto-makers have collaborated:

*The Toyota 86 and the Subaru BRZ are 2+2 sports cars jointly developed by Toyota and Subaru, manufactured at Subaru's Gunma assembly plant.<sup>4</sup>*

*The 2+2 fastback coupé is noted for its naturally-aspirated boxer engine, front-engine, rear-wheel-drive configuration, 53/47 front/rear weight balance and low center of gravity...*

The above models were introduced in the U.S. in 2013, and are still going strong. The second generation of these designs were introduced in 2021. This this is considered a successful model by both manufacturers.

Until 2022 (2023 model) neither had a U.S. EV, except for the limited production Toyota Mirai hydrogen fuel cell vehicle. Thus both decided to jointly develop a mainstream crossover EV, The Toyota bZ4X and Subaru Solterra. These are distinctly different vehicles, but both use the same dedicated EV Platform (e-TNGA for Toyota and e-Subaru Global Platform for Subaru). I will cover each of these below. Note the pricing below does not include federal or state incentives covered above.

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<sup>4</sup> Wikipedia article on Toyota 86, [https://en.wikipedia.org/wiki/Toyota\\_86](https://en.wikipedia.org/wiki/Toyota_86)

### 3.1. Toyota bZ4X

*In its basic configuration and starting at \$43,215 before EV incentives, the 2023 Toyota bZ4X is front-wheel drive and carries a 71.4-kWh battery, which motivates a motor making 201 hp and 196 lb-ft of torque. This test is of the available all-wheel-drive powertrain, which starts at \$45,295,<sup>5</sup> and features front and rear motors juiced by a 72.8-kWh pack for combined totals of 214 hp and 248 lb-ft...<sup>6</sup>*

*The dual-motor powertrain proves sweet in everyday driving. Compared to Toyota's wheezy naturally aspirated I-4, peaky V-6, and groaning hybrid engines, it's enjoyably—even provocatively—swift. Accelerative context is provided by audible yet unobtrusive motor whine. The motors are tuned harmoniously, maintaining balance if accelerating with the steering wheel turned.*



*At best, range comes in at 252 miles for the single-motor powertrain in XLE trim. At worst, it rates at 222 miles, as is the case for this dual-motor Limited test vehicle...*

*In one session with an Electrify America 150-kW DC charger, we saw the bZ4X briefly reach a charge peak of 65 kW, leading to a 64-minute wait for the Toyota to charge from 5 to 80 percent...*

I found this warning on the bZ4X's web site: "2023 bZ4X currently available in select states only and in extremely limited quantities."<sup>5</sup>

### 3.2. Subaru Solterra

*Subaru of America, Inc. today announced pricing on its first-ever all-electric SUV, the 2023 Subaru Solterra... The 2023 Solterra is offered in three trim levels, Premium, Limited, and Touring, and will begin arriving in limited numbers at Subaru retailers this summer.<sup>7</sup>*

*Pricing for the 2023 Solterra starts at \$44,995 MSRP for the Premium trim...*

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<sup>5</sup> The base price of the AWD variant was a about \$50k on this site: <https://www.toyota.com/bz4x/>

<sup>6</sup> Alex Leanse, Motor Trend, "2023 Toyota bZ4X AWD First Test: Among the Quickest, Best-Driving Toyotas," May 23, 2022, <https://www.motortrend.com/reviews/2023-toyota-bz4x-limited-awd-first-test-review>

<sup>7</sup> Subaru Solterra Main Page, <https://www.subaru.com/solterra-ev>

*Solterra comes standard with a new Symmetrical All-Wheel Drive system that now channels smooth linear output from Subaru StarDrive® Technology, providing outstanding traction and capability in all kinds of weather and terrain. Subaru StarDrive delivers substantial on-demand torque at all speeds with driver-selectable power and regenerative modes.*



*The all-new electric SUV delivers a total of 215 horsepower and 249 lb.-ft. of torque from front and rear electric motors. Solterra is equipped with Dual-Function X-MODE® with Snow / Dirt and Deep Snow / Mud modes on all trim levels. The system also features Grip Control and Downhill Assist Control for increased performance in low-friction and off-road conditions. With 8.3 inches of ground clearance, Solterra is best in its class. Standard Active Cornering Assist and Vehicle Stability Control provide better stability and handling. This combination provides versatility in both off-road and city driving.*

*Solterra's high-capacity lithium-ion battery pack provides plenty of daily range. The electric SUV can quickly charge just about anywhere with its Level 2 AC and DC fast charging capability. With DC fast charging, Solterra can charge up to 80-percent of total battery capacity in under an hour.*

*The all-electric SUV offers a suite of standard EyeSight® driver assist technologies including Emergency Steering Assist, Intersection Collision Avoidance Support, Pre-Collision Brake Assist, Lane Departure Prevention, and Dynamic Radar Cruise Control with Lane Tracing Assist.*

*Vehicle deliveries will begin in the Summer of 2022. The Subaru Solterra is available in all 50 states.<sup>8</sup>*

**Author's Comment:** The Solterra, appears to be the best value for its price of any EV SUV I have seen. Note that it comes standard with AWD, and Subarus are highly valued in snow country.

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<sup>8</sup> Subaru News Release, "Subaru Solterra Reservation System Opens Today," Feb 8, 2022, <https://media.subaru.com/pressrelease/1858/1/subaru-solterra-reservation-system-opens-today#>

## 4. Ford Seriously Ramping

*Ford has announced plans for an all-electric commercial vehicle for its Pro customers. The firm will also invest \$3.7 billion in its Michigan, Missouri and Ohio manufacturing plants in order to get them ready for its next-era of products. The Blue Oval plans to create 6,200 new UAW jobs in the US and convert 3,000 temporary workers to permanent full-time status. Ford CEO Jim Farley had the following to say:<sup>9</sup>*

*"We're investing in American jobs and our employees to build a new generation of incredible Ford vehicles and continue our Ford+ transformation. Transforming our company for the next era of American manufacturing requires new ways of working, and together with UAW leadership, we are leading the way and moving fast to make improvements to benefits for our hourly employees and working conditions for our factory teams."*

*Ford will provide all hourly employees with healthcare benefits and aims to improve the workplace environment. The firm wants to do this by listening to employee feedback. The automaker is currently exploring ways to increase the number of EV chargers in the workplace, provide employees with healthier food and install better lighting in facility parking lots.*

*As for the upcoming commercial EV, Ford confirmed it will arrive mid-decade and will be built in Ohio. This news comes hot in the heels of first F-150 Lightning deliveries. The Lightning is manufactured in Michigan and is one of the most in-demand vehicles currently on sale.*

*Wilbur-Ellis, a global distribution leader in sustainable agriculture products and consulting, and Pacific Gas and Electric Company, California's leading electricity provider serving northern and central California, are announcing plans to add Ford battery electric trucks and vans, Ford Pro Charging solutions, charging software and Ford Pro E-Telematics† to their fleets.<sup>10</sup>*

*"At Ford Pro, we're aligning our business model to support customers who want to create a positive impact on people and the planet," said Ted Cannis, Ford Pro CEO. "We know the transition to electric vehicles can come with uncertainties. That's why we're focused on working with pioneers like Wilbur-Ellis and PG&E, helping them quickly realize the benefits of combining electric vehicles with charging solutions and data insights to help achieve their sustainability goals, improve how energy is managed, accelerate their productivity and improve bottom lines."*

*Wilbur-Ellis plans to add F-150® Lightning™ Pro trucks, Ford Pro Charging\*\* solutions, charging software and in-vehicle telematics into its fleet in Sonoma County and the Salinas Valley of California. As part of the strategy to meet its stringent new sustainability goals, the company will integrate 10 battery electric trucks initially, while learning to optimize energy solutions alongside Dutton Ranch, a longtime Wilbur-Ellis*

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<sup>9</sup> Ben O'Hare, Inside EVs via MSN, "Ford: New Commercial EV Is On The Way, \$3.7 Billion Invested In Midwest Manufacturing," June 5, 2022, <https://www.msn.com/en-in/autos/news/ford-new-commercial-ev-is-on-the-way-dollar37-billion-invested-in-midwest-manufacturing/ar-AAY6xu7?ocid=BingNewsSearch>

<sup>10</sup> Business Wire via Yahoo Finance, "Ford Pro Leading Companies into Electrified Future with Electric Vehicles, Charging Solutions, In-Vehicle Software," May 23, 2022, <https://finance.yahoo.com/news/ford-pro-leading-companies-electrified-100000726.html>

*customer that is already testing Ford Pro vehicles, charging and software in real-world farming conditions as part of a pilot program with the Sonoma County Winegrowers...*

*The Ford Pro survey\* also reveals more than 50% of commercial customers see infrastructure setup as a top concern in transitioning to electric. Ford Pro Charging\*\* is a critical part of the solution, helping businesses large and small potentially reduce operating costs by optimizing the best time to charge vehicles, in addition to offering consulting services to help businesses plan, install and maintain charging services based upon their unique needs.*

*PG&E is continuing its ongoing electric vehicle collaboration with Ford, announced in March, now with Ford Pro to add charging hardware and software solutions to select F-150 Lightning Pro trucks into its California fleet. The company will begin testing energy management improvements using Ford's vehicle-to-grid technology. As part of the initiative, PG&E will assimilate the electric vehicles into its fleet operations alongside Ford Pro charging stations and explore leveraging the F-150 Lightning Pro batteries to shave peak energy usage at one of its depot locations.*

*"We are in a transformative moment at the intersection of the utility and transportation industries and we have a very real opportunity in front of us to deliver for our customers, business owners, hometowns – and our planet – for the better," said Jason Glickman, Executive Vice President, Engineering, Planning, and Strategy, PG&E. "PG&E's collaboration with some of the world's leading automakers will allow us to engage in the full ecosystem of potential with original equipment manufacturers, like Ford, to advance bi-directional EV charging technologies for a cleaner, safer and brighter future for all."*

*Today's announcement coincides with a pilot program between Ford Pro and Sonoma County Winegrowers, designed to create a blueprint for how industries and companies can best adopt and manage battery electric vehicles for the next frontier in sustainable fleet operations using Ford Pro products and services. The pilot includes seamlessly integrating Ford Pro Telematics into farmers' existing gas fleets.*

*"We have over 50 vehicles on Ford Pro Telematics and have already identified insights that are improving our bottom line like long idle times costing us an estimated \$24,000 per year in wasted gas," said Marissa Ledbetter of Vino Farms in Sonoma County. "Ford Pro Telematics has improved efficiency and productivity by helping us reduce vehicle downtime through complete visibility into maintenance needs, and we expect those benefits to grow as electric vehicles and charging stations become a more regular part of our operations."*

*Already in these early weeks, the pilot program has sparked interest from ranches around Sonoma County exploring ways to operate more efficiently. As a result, Sonoma County Winegrowers has offered Ford Pro Telematics to all 1,800 members for one year as farmers look for ways to improve efficiency, even in fleets of gas-powered vehicles.*

*Ford Pro Telematics is designed to work on Ford and non-Ford vehicles alike to ensure customers can leverage the benefits of the software across their entire fleet.*

*Ford Pro is also helping government agencies and businesses of all sizes do their part to address the urgency of climate change and help accelerate progress toward a sustainable future by showing them the clear advantages of an electric ecosystem. Ford Pro recently launched relationships with industry leaders on sustainability such as United Rentals, Penske Truck Leasing and Sunbelt Rentals®.*

## 5. More on PG&E's Fleet Electrification

*Electric vehicles and other alternative fuels have been piquing Jameson Reichert's interests since he can remember... Fifteen years later, he has a much bigger project on his hand: Electrifying Pacific Gas & Electric, the largest regional utility fleet in the U.S. "Back then, that was still not exactly a mainstream thing," the Michigan native told FleetOwner of his early forays into zero emissions. So, he had to head out west to pursue a future in clean transportation. "PG&E seemed like it was at the forefront of that industry, so it seemed like the perfect opportunity to come out here to California."<sup>11</sup>*

*Reichert is now a senior fleet engineer for PG&E, which has one of the largest battery-electric fleets in North America. The 49th largest commercial private fleet in the U.S. provides transportation services for the 117-year-old utility provider. Based in Oakland, the company has more than 5 million customers in central and northern California.*

*Its fleet includes more than 14,500 vehicles that cover nearly every duty cycle. These include construction and off-road equipment, snowcats, UTVs, and specialty gas and electric utility fleet assets. More traditional assets range from Classes 1-8: light-duty passenger cars and pickup trucks, medium-duty service trucks, aerial trouble trucks, gas welding, heavy-duty gas crew vehicles, electric line, material handlers, and day cab tractors.*

*PG&E... was named the overall 2022 Best Private Fleet by FleetOwner editors. The fourth-largest utility fleet in the U.S., PG&E is firmly committed to sustainability. Its work in California is laying the groundwork for fleets across the country that will be working to reduce emissions in the coming years...*

*But the giant fleet has bigger clean-energy goals ahead. These include converting all its light-duty, 50% medium-duty, and 20% heavy-duty vehicles to EVs by 2030...*

*OEMs have told Reichert and his team it could take a few years before medium-duty and larger EV chassis can be upfit with PG&E's needs. "Well, we don't really have a few years," he said. "But it's a challenge I figure is the culmination of my career. I've wanted to do this for so long. It's a pretty awesome career goal to electrify most of the PG&E fleet."*

*Most medium-duty EV chassis coming to market are aimed more at delivery fleets than utilities, which require auxiliary power units to run the hydraulic systems, compressors, and electrical power. Typically, a Class 5 chassis holds these "trouble trucks," as PG&E calls them. They're the vehicles that respond to downed power lines or other outages. The current trouble trucks get fuel mileage similar to a Class 8 tractor-trailer. Often they are stationed overnight at operators' homes so they can respond immediately to emergencies (see image below).*

*Not only does the utility and its partner OEMs have to figure out how to power that 19,000-lb. truck, but it has to create a home-charging network as well. "If I could grab the battery pack from a Tesla Semi and shove it into a pickup truck, maybe I could make it work—but I'm hoping technology finds a path to that one," Reichert said.*

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<sup>11</sup> Josh Fisher, FleetOwner, "2022 Private Fleet of the Year: Pacific Gas & Electric," June 14, 2022, <https://www.fleetowner.com/operations/article/21242388/2022-private-fleet-of-the-year-pge>



*For now, PG&E is focusing on half-ton pickups and other light-duty vehicles to meet its 100% EV goal by the decade's end. He was expecting the fleet's first deliveries of the Ford F-150 Lighting to arrive soon. "We're super jazzed to get those and finally put them in the fleet," Reichert said.*

*The battery-electric Fords PG&E is expecting will all come with the extended-range battery, which offers up to 320 miles on a full charge. Over the years, being among the first in the U.S. to electrify fleet vehicles has taught Reichert and his team that if something goes wrong on the road or a truck with new technology ends up in the shop regularly, the operators and technicians won't let the fleet's leaders forget it.*

*"We want to give our operators the best of the best," he explained. "If you make a bad impression with something, it will haunt you for a very long time. So it's very important on the management aspect to educate them ahead of time, get your mechanics on board with training, and understand what these are. The more stakeholders you bring in early—instead of just forcing a vehicle on them—pays huge dividends."*

*As it adopts more clean transportation technologies, PG&E is also grappling with the industry's technician shortage. The utility created a new hiring program in 2021 that drew more than 1,000 applicants...*

*"I'm excited for the new workforce that's coming in," Glover said. "The new workforce is bringing a lot of new talent and at the same time is adding to their skills by learning from the best of the best in the industry, our experienced PG&E mechanics. They're also bringing a lot of industry experience, feedback, and solutions as we get into this kind of next wave of technology."*

*The PG&E's transportation services team has about 400 members spread out over 64 garage locations, supporting the fleet's day-to-day operations. This work includes field operations, engineering, compliance, fuel procurement, diagnostics, technical training, telematics, and vehicle procurement....*