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## THE FEBRUARY 2024 ISSUE IN BRIEF

THIS ISSUE OF *THE DISPATCHER* is focused on one element of the business of delivering transport: what is the best power source for vehicles to balance both economic and environmental well-being. I continue to question whether the full electric powertrain system is the most optimum way to move everyone and everything around, or whether it would be much better to use a combination conventional ICE and electric powertrain, as with hybrid vehicles, to get the job done. This is not just a technical question of what delivers the most power for the lowest cost or the lowest amount of tailpipe emissions. There are social and general welfare issues that must be factored into any equation that is intended to deliver an optimum answer for everyone everywhere. It is unlikely that there is only one answer, and that is increasingly evident as the sales of battery electric vehicles (BEVs) slow down in all major markets, and the sales of hybrids grow.

The problem I have with the exclusive bet on BEVs as the only solution for future vehicle powertrains is not with BEVs per se. It is with governments establishing industrial policy for their countries, and supra-governments like the EU, and supra-quasigovernments, like the United Nations, assuming the position of determining industrial policy for national governments, but doing it without an agreement on goals. In my opinion, public organizations have done an adequate job of informing people that human activity is causing the Planet's average temperature to rise in most places, but they have done a terrible job explaining why this is happening, how it is happening, and whether there is agreement on what do about it.

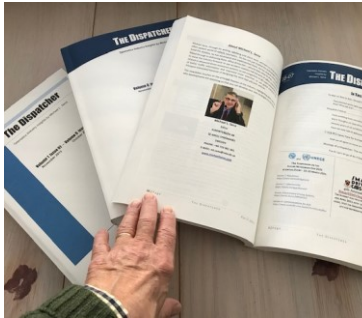
When all is said and done, it all comes down to money. We need a new Bretton Woods, not more COPs, to establish a stable economic climate for the climate, like Bretton Woods established a stable climate for trade.

# THE DISPATCHER

Mobility Industry Insights by Michael L. Sena

February 2024 – Volume 11, Issue 4

## Feature: The Business of Delivering Transport



### Feature Articles



The real case for driverless mobility



Vehicle-related telecommunications



Automotive artificial intelligence



The business of delivering transport systems



People and transport – the effects of how and where we live, work, and recreate on our requirements for transport



Standardization and regulation of transport systems

### **Melting ICE is proving to be a big challenge**

WE ARE REMINDED often that 2024 is a big year for voting. One-half of the people in the world will go to the polls. It is a presidential election year in the U.S., and control of the Senate and House of Representatives is once again anyone's guess. European Union parliamentary elections will be held in June, and the current European Commission President (not elected by popular vote) will attempt to be chosen to continue in her position. Taiwan has already voted, and they did not vote for the China-friendly candidate. Elected officials set the agenda for their country's (or region's in the case of the EU) climate policies, often without revealing those policies before they are elected, or giving just a broad brush picture of what they will do once they are safely in the leader's chair. One U.S. president, state governor, EU Commission leader, or parliamentary majority after the other has made significant changes to legislation in the name of stopping climate change, often without a democratic mandate to do so.

These actions have had consequences, and those consequences are now materializing, coming out in the open for all to see and, more importantly, to experience. Their impacts on the passenger car industry, both for those who make and sell them and those who purchase them, are now clear. Reckoning day for the global passenger car industry will soon arrive. The showdown has been gestating for years, but now all the forces have aligned to bring it to a head. No, my next sentence is not going to be: "Musk wins! The car industry throws in the ICE towel." Far from it. I believe the big bets made on battery electric vehicles by western governments – and by China – are already backfiring on their car companies. Why? They forgot that consumers decide, with their feet and with their money.

*Even a predictable ending can change*

A year ago, the future of the automobile world looked like it was all sewed up. Western governments were forcing car companies to get out of the ICE business and commit to BEVs. These governments were doing their utmost to force consumers to purchase BEVs by making it impossible to afford to own and operate ICE vehicles. They were throwing money at those who could have afforded the high BEV price tag so they would feel dumb if they didn't take the money and put a BEV in their driveway. With Western companies out of the ICE business, the stage would be set for cheap Chinese ICE vehicles (which Chinese companies have kept pumping out) to be dumped anywhere that BEVs were either not practical or were blocked because of trade restrictions, like in the U.S., and for cheap Chinese BEV vehicles to be dumped into Europe where they could undercut European brands on price. This has already started with Chinese brands BYD and MG (SAIC) going to the top of the car sales lists in some European countries.

*The Economist*, and economists, were cheering (See sidebar). They maintain that products should always be made where they can be produced at the lowest prices, known as "comparative advantage". Adam Smith first alluded to the concept of "absolute advantage" as the basis for international trade in 1776, in The Wealth of Nations. David Ricardo developed the classical theory of "comparative advantage" in 1817 to explain why countries engage in international trade even when one country's workers are more efficient at producing every single good than workers in other countries. These theories provided the foundations for global trade on Planet Earth as it exists today.

But then political and economic events began occurring that have put a spanner in the works, and that is what I want to present here. It is fitting that COVID-19 and the recession that has occurred in its wake and as a direct result of Russia's rogue nation behavior have put potholes and bumps in the road for the CHINA, INC. express bus that was taking the country on its twenty-five-year ride to the top of the world's economic heap. It is ironic that a Republican president (the one who lost the election in 2020) was the one who broke faith with free trade (which had been a signature policy of that party since 1981 when Ronald Reagan took office) and

### **Maybe a bit biased**

*Just as I was putting the final touches on this article, the January 13th issue of THE ECONOMIST arrived. The cover showed a dozen Chinese BEVs as alien warships heading toward earth with the title: 'China's EV Onslaught'. In the first Leader, which read like a Chinese Communist Party propaganda piece, the first paragraph ended with the following text: "Now China's carmakers are enjoying an astonishing rise. That stokes fears of another ruinous shock. In fact, the successes of Chinese cars should be celebrated, not feared." The Leader ends with this: "If China wants to spend taxpayer's money subsidising global consumers and speeding up the energy transition, the best response is to welcome it."*

*When it came to the issue's three-page Briefing, THE ECONOMIST journalist writes like he or she is quoting from a SAIC or BYD brochure, with lines like Chinese vehicles are "setting new standards," upending the industry with "China speed," and referring to Western car companies as "roadkill". One analyst is quoted as saying that the Western car industry should just throw in the towel and cash out while they can. After what has to be considered an unassailable build-up, the journalist backtracks under the headline 'Speedtraps'. But one statement made me think that the Chief Editor just assigned this piece to a newbie to see how he/she would do. This is the statement that gave me a clue: "STELLANTIS (whose largest shareholder owns a stake in The Economist) has had little presence in China...but in October it signed a deal with LEAPMOTOR to make and sell low-cost Evs outside of China." The largest shareholder of STELLANTIS, is, as anyone working in the car industry knows, EXOR, which is 52% owned by the Agnelli family, which founded FIAT (now part of STELLANTIS). And the share of THE ECONOMIST owned by EXOR is 43.4%. I'd say that was a bit more than a 'stake', wouldn't you? And the fact that Carlos Tavares once warned of a "terrible fight" with the Chinese in the pages of THE ECONOMIST, but is now critical to the EU Commission probe, may have quite a lot to do with the recent tie-up with LEAPMOTOR, and in the end, why this piece was written in the first place.*

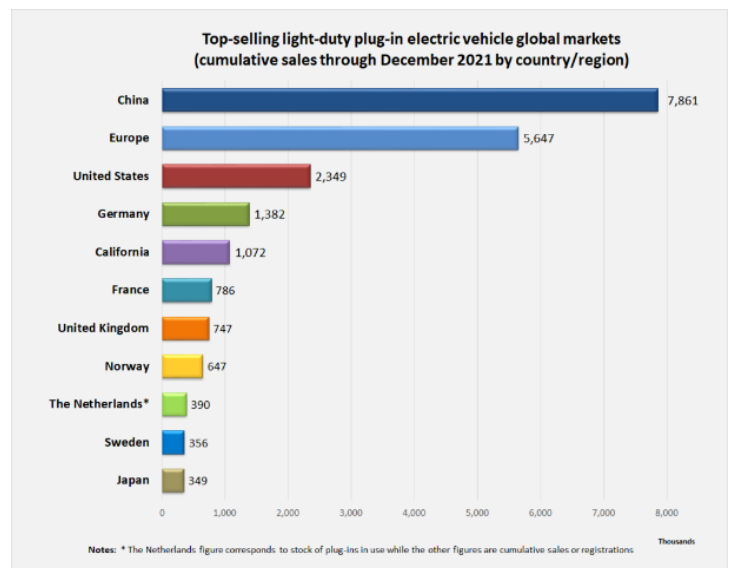
began to institute tariffs, starting with steel. “To rationalize the imposition of steel protection, the 45<sup>th</sup> president’s administration had to declare publicly that numerous NATO and other defense treaty partners (e.g., Japan and Korea) posed a national security threat to the United States. Both this claim and the adversarial approach inherent in blocking a partner’s exports have significantly strained relations with key allies, have undercut the idea of the United States as a responsible leader, and have thus diminished American standing in the world,” said a member of the REAGAN FOUNDATION.<sup>1</sup>

### Four major forces have been at work

Here are the principal forces that I believe have controlled the direction of the global automotive industry during the past decade, and have now prepared the way for what that industry will look like in the coming years.

#### 1. China builds an end-to-end BEV industry<sup>2</sup>

As it has done with many other industries, such as steel, aluminum, concrete, and many more, China encouraged the formation of a domestic battery electric car industry by providing both the financing for building them and the incentives for Chinese consumers to buy them. As the chart to the right shows, by 2021 as many BEVs were sold in China as in the U.S. and EU combined. And, as it has happened in the past with other industries, China now has over capacity that it will export to the rest of the world at rock bottom prices. Not only does China have overcapacity in BEV car production, it has a near monopoly on all of the components that are needed to build the batteries that power the vehicles. This means that it can control who obtains both the batteries and the minerals used to make them, and it can control the prices for companies outside of China who might attempt to compete with Chinese producers, whether it is making batteries or cars.



<sup>1</sup> <https://www.reaganfoundation.org/reagan-institute/publications/is-the-gop-still-the-party-of-free-trade/>

<sup>2</sup> I wrote about this in the December 2022 issue of *THE DISPATCHER*.

## 2. *The U.S. and EU finance the growth of BEVs*

Through rebates and tax incentives to individuals and businesses to purchase BEVs and install the necessary charging infrastructure, consumers have bought cars with luxury vehicle prices, along with add-on costs for operation (e.g. home charging stations) and the inconvenience of the entire charging regimen, that would have put off any buyer who was not totally committed to owning a battery electric car for ideological reasons. Instead of allowing the market to move to BEVs at a pace which was defined by the natural lowering of vehicle prices due to higher volumes, western governments used tax money obtained from all citizens to allow the car companies to continue to build expensive battery electric cars that cannot be sold profitably at affordable prices to the mass market.

## 3. *The U.S. initiates a BEV trade war with China*

The Inflation Reduction Act of 2022 blocks the sale in the U.S. of BEVs built with foreign content. This protectionist legislation is aimed principally at cars built in China, or with batteries made in China or sourced from China. It was intended to foster a domestic end-to-end BEV industry, just like the one in China. There are two problems with this. First, China already controls most of the minerals needed to make batteries, and it owns most of the processing capacity for turning those minerals into batteries. Second, neither the states nor the federal government has the financial means nor the political power to force all consumers to buy BEVs, especially those consumers who truly cannot afford cars with luxury prices and with additional costly hassles to operate them.

## 4. *The climate change movement becomes political*

The 'climate change movement' has become a *doppelgänger* of past protest movements, like the anti-Vietnam war protests and the anti-nuclear protests. The shrill and uncompromising tone of the activists (e.g., Extinction Rebellion) calling for the halt of global warming by disfiguring priceless paintings in museums and gluing themselves to roadways to block traffic has been polarizing and has engendered the establishment of a counterforce of climate change deniers. Policies for and against greenhouse gas emissions reductions have found their way into political platforms and serve as divisive issues. For twenty-nine years, the United Nations has been the



host of the party of “parties”, and each one is a larger gathering of groups shouting at each other.

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*The UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC) was established as a result of a UN treaty that came into force in March 1994. Its purpose was to “combat dangerous human interference with the climate system, in part by stabilizing greenhouse gas concentrations in the atmosphere.” The treaty called for “ongoing scientific research and regular meetings, negotiations, and future policy agreements designed to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.” The **Kyoto Protocol**, signed in 1997 and effective from 2005 to 2020, was the first implementation of the UNFCCC measures. It was superseded by the **Paris Agreement**, which went into force in 2016. The “supreme” decision-making body, called the Conference of the Parties (COP), meets annually to discuss progress. The latest COP meeting was COP-28, which was held in Dubai.*

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The biggest problem with UNFCCC, and why so little has been accomplished during its twenty-nine years, is that it gave China a free ticket as a “developing country” to keep pouring out greenhouse gases, which it has done with a vengeance, and placed the burden of paying for the party (essentially reparations) principally on the U.S. and other Western countries for having industrialized first. This is a gross oversimplification, but is closer to the truth than the party-goers would ever admit.

This is why the ‘No Fossil Fuels’ lobby’s win in Dubai was actually a loss. The COP 28 agreement reached in Dubai includes a mention of fossil fuels, which is a first. With the commitment to “transition away” from fossil fuels, climate activists were congratulating themselves on finally bringing the oil, coal, and gas producers to their knees. Unfortunately, climate activist groups continue to ignore the simple fact that electric cars run on electricity that has to be produced, and there simply is not enough land for solar panels and wind for wind turbines to produce all the electricity needed to power the world that is filled with 90 million new electric cars coming into it each year. An open-ended statement like the one in the final COP-28 agreement does absolutely nothing to either stop adding greenhouse gases to the overabundance of what is already in the atmosphere, or to take steps to remove them. (See *Dispatch Central: Net Zero Emissions*.)

Let's look at the implications of each of these forces to show how they would have resulted in a Europe filled with Chinese-produced BEVs and most of the rest of the world filled with Chinese-produced ICE vehicle—if consumers in the U.S. and EU hadn't woken up.

### **China's cars at the gates of America and Europe**

Anyone who has been reading this newspaper for the past eight years or so knows that I have been sounding the warning about the Chinese Communist Party government's determination for its car industry to rule the world. It realized it would never get there with ICE technology, even though it had been able to make passable fossil-driven cars and trucks that were sold mostly in the home market employing technology that Western car companies were obliged to hand over to their obligatory Chinese joint venture partners. Battery electric vehicles were easier to build, the government reasoned, and if Chinese companies could control the materials needed for making batteries, and could corner the market on the processing of those materials, it would have an unbeatable advantage. It proceeded to do both without so much as a "How do you do?" by the car-making countries' governments.

CHINA, INC. did everything it needed to do to create a domestic market for BEVs, from encouraging and financing the build-up of hundreds of manufactures of the vehicles and the batteries, to providing incentives for consumers to buy them. In fact, they did too good a job of building up the supply side. Perhaps the government planners thought that the consumers in the U.S. and Europe would open up their hearts, minds, and pocketbooks for BEVs produced in China like they did with everything else without batting an eyelash. Maybe they didn't plan on the little blip caused by COVID-19 and by the bigger recession blip that followed. Or maybe they didn't count on Western companies having the will to jump into the fray with cars that were superior to the Chinese-built ones. And maybe they did not include in their planning the possibility that a U.S. president would essentially close the second largest car market to their cars and their batteries. In any case, they had an oversupply before Western markets were ready to absorb their cars, but they decided to press the START button anyway.

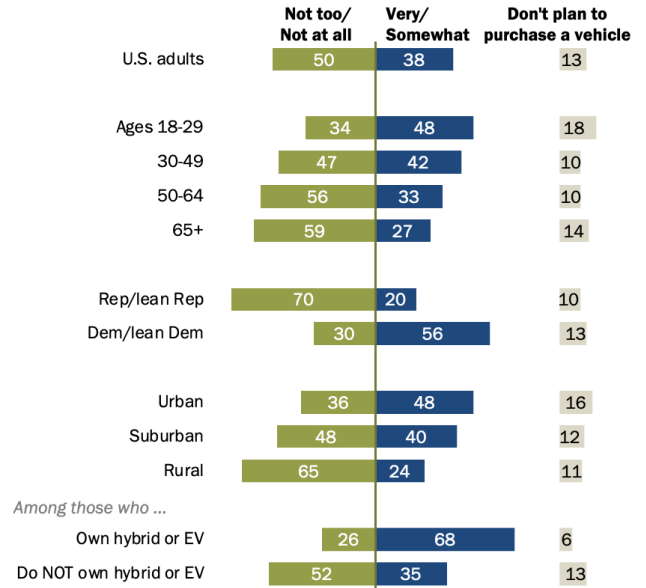
*Moving buyers into BEVs proved more difficult than expected*

Policies for incentivizing buyers to choose BEVs worked in those places where there were enough purchasers who could afford the high purchase prices of *Teslas* even without rebates, who owned a house where they could install a charger or worked for a company where chargers were installed in the parking lots and garages, and who owned a second car for the trips to places where charging was problematical along the way and at the destination. Sounds like California to me. BEV sales were going swimmingly. Car companies like VOLVO CARS declared that by 2030 they would manufacture only BEVs; countries like the UK declared that only BEVs would be sold starting in 2030. There was only one, small, niggling problem: Consumers were not and still are not sold on BEVs.

A poll published in June 2023 by the PEW RESEARCH CENTER found that less than 40% of Americans would even consider buying a battery electric vehicle the next time they purchase a vehicle.<sup>3</sup> That is less than the results from the same survey conducted a year earlier. The percentages vary by age, political party predilection, and space between dwellings. In the third quarter of 2023, BEVs represented only 8% of total U.S. car sales. During that period, GM sold 20,000 BEVs compared to 600,000 ICE vehicles. BEVs are piling up on car lots. More than twice as many BEVs are sitting unsold compared to ICE cars and light trucks. COX AUTOMOTIVE reports that there was a 114-day supply of BEVs at the beginning of December compared with 71 days for the overall auto industry. “Outside California, Florida and Texas, which together account for over half of American BEV registrations, electric cars mostly remain a curiosity.”<sup>4</sup> The frigid temperatures across the U.S. during the winter of 2024, which cause BEVs to lose range, will not endear BEVs to more buyers.

**Democrats, younger adults and urban residents are more open to purchasing an electric vehicle**

*% of U.S. adults who say they are \_\_\_ likely to seriously consider purchasing an electric vehicle the next time they purchase a vehicle*



Note: Respondents who did not give an answer are not shown. “EV” stands for electric vehicle.

Source: Survey of U.S. adults conducted May 30-June 4, 2023.

PEW RESEARCH CENTER

<sup>3</sup> <https://www.pewresearch.org/short-reads/2023/07/13/how-americans-view-electric-vehicles/>

<sup>4</sup> A revolution stalls, *The Economist* December 2<sup>nd</sup> 2023. Page 61.



### *Carmakers are hitting the brakes and dealers are concerned*

FORD announced in October that it would delay its \$12 billion investments in electrifying its fleet. GM has set to one side some of its ICE-to-BEV investments and added a year to starting to pump \$4 billion into converting its factories to produce electric cars. AUDI CEO, Gernot Döllner, said in December that its mid-decade goal to make similar profits on selling BEVs to those earned selling ICE vehicles will not be met. The company had announced that it would stop developing ICE vehicles from 2026, and sell only BEVs from 2033. “But,” he said, “the profit margins between internal combustion and electric cars are not converging as quickly as we had hoped.” Even battery suppliers have turned from sanguine to sombre. In September, SK BATTERY laid off more than 100 employees in its State of Georgia plant and reduced output. In November, LG ENERGY SOLUTION announced that it would lay off 170 workers in its Michigan plant.

A group of 4,000 U.S. car dealers, calling themselves *EV Voice of the Customer*, wrote a joint letter in November to President Biden asking him to “tap the brakes on the unrealistic government mandates for EVs.” That mandate is to have BEVs make up more than 50% of all U.S. auto sales by 2030. That’s going from around 7-8% today to 50% in six years. So far, there has been no response from the White House to the letter.

### *Surprise: most American consumers turn out to be price-sensitive*

Everyone is searching for the answer to why American car buyers are not flocking to BEVs like everyone hoped, expected, dreamed of, and wished for on a star. The answer is simple: **COST**. With all the subsidies, pay-backs, incentives, (and even ICE shaming), it turns out that BEVs are too expensive to own for most consumers, compared to ICE vehicles – about \$10,000 more expensive. The average BEV sells for \$52,000, just \$4,000 more than the \$48,000 Americans pay on average for an ICE. However, when you add in the charger, insurance (which is more expensive for lots of reasons), and less expensive fossil fuels compared to EU and China, the total is over \$65,000 for an ICE. Add to this the fact that BEVs lose their worth faster than ICE vehicles with similar price tags, that they are not at the top of anyone’s high quality list (especially not J.D. POWER’s), that battery problems persist, that range plummets in cold weather, and you have more reasons for consumers to be wary.

Even car rental company HERTZ is adding a negative voice to the BEV discussion. It announced in January 2024 that it was selling one-third of its BEV fleet, or 20,000 cars, including *Teslas* and *Polestars*. TESLA makes up about 80% of HERTZ's BEV fleet which is 11% of HERTZ's total rental fleet. It will use the money from the sale to purchase ICE vehicles. The reason given by HERTZ is COST. "Collision and damage repairs on a BEV can often run about twice that associated with a comparable combustion engine vehicle," said Hertz CEO Stephen Scherr in an analyst call reported by CNN Business.<sup>5</sup> "Despite costing less to maintain, they have higher damage-repair costs and higher depreciation." Scherr continues: "Besides costing more to repair when they're damaged in a crash, they are also getting in more crashes."<sup>6</sup> HERTZ will take a loss of about \$245 million for depreciation on the 20,000 cars, which is an average of about \$12,250 per vehicle.

It is not just in the U.S. where the number of potential buyers of BEVs is dwindling. In Sweden, where the *Tesla Model Y* sailed up to the top of the most-sold-car list in December 2023, buyers are not buying BEVs like they did a year ago. The order book for BEVs is 25% lower than this time last year when 50% of new orders were for BEVs. It's the lower cost of fuel, which is the result of the government keeping its campaign promise to voters, and a real recession. The curve for BEV sales has turned down in all of Europe.

What are they buying instead? Hybrids.<sup>7</sup> In a December 24, 2023 article in *FORTUNE*, *The EV boom may be petering out, but Americans are buying record numbers of hybrid cars*, *ASSOCIATED PRESS* journalist Tom Drisher writes: "Instead, buyers are increasingly embracing a quarter-century-old technology whose popularity has been surging: The gas-electric hybrid, which alternates from gas to battery power to maximize efficiency." (See *Musings* in this issue: Hybrid Dreaming.)



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<sup>5</sup> <https://edition.cnn.com/2024/01/11/business/hertz-tesla-selling/index.html>

<sup>6</sup> There is research into why there are more accidents with BEVs. See <https://www.cnn.com/2024/01/18/business/why-do-people-keep-crashing-teslas/index.html>

<sup>7</sup> <https://fortune.com/2023/12/24/record-sales-hybrid-electric-vehicles-cars-ford-toyota/>

*Are the politicians setting tax policies walking the walk?*

If putting the walk where the talk is is any indication of what to expect from consumers, only 25 U.S. senators and congressmen, out of a total of 535, actually drive battery electric cars. That's 4.7%, which is just slightly more than one-half of the percentage of Americans who bought BEVs in 2022. Twenty-three of the BEV-buying legislators are Democrats.<sup>8</sup>

*Industrial policy by any other name is still a bad idea*

Picking winners, and betting taxpayers' money on which industries should succeed and which ones should fail, is what politburos do. For Western governments to copy what China has done with the BEV industry is ironic, especially now that the big crevasses in that policy are showing up clearly in China. In an August 21<sup>st</sup> 2023 article in the *WALL STREET JOURNAL*, titled *The Electric-Vehicle Bubble Starts to Deflate*, WSJ's Editorial Board describes what is happening in China.

*"About 400 Chinese electric-car makers have failed in the past several years as Beijing reduced industry subsidies while ramping up production mandates. Scrap yards around China are littered with EVs whose technology has become outdated. Automakers are having to slash prices to sell cars they are required to make, which is eroding margins. As with real estate, Chinese government support inflated EV investment and misallocated capital that could have been put to more productive uses. Now comes the destruction that invariably follows the government creation, which may be a harbinger for the U.S. as the Biden administration emulates China's EV industrial policy."*

The article goes on to describe what is happening in the U.S., with BEV start-ups like NIKOLA and LORDSTOWN MOTORS struggling and the Big Three being forced to slash prices on BEVs to try to move them off the lots. They are also raising prices on their ICE vehicles, which are selling well, in order to cover their growing losses on BEVs. (See sidebar.)

### **Never underestimate the intelligence of consumers/voters**

Normal folks who buy cars and vote are a lot smarter than most politicians give them credit for being. In an election year, those who are in opposition will play the BEV card: "They're too expensive for most of us. The government has been subsidizing the rich and making owning and driving a normal car more expensive for us. They're destroying good

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<sup>8</sup> <https://www.politico.com/news/2023/07/30/lawmakers-drive-electric-vehicle-00108833>

### *A Cavalcade of BEV Failures*

*Overhyped car concepts at CES*  
*"Only two years ago, the Lordstown Endurance, a finalist for North American Truck of the Year honors, went on display in the convention center's West Hall. Now, the bankrupt truck maker might have to pay the Securities and Exchange Commission a \$45 million penalty for violating federal securities laws.*

*"In 2020, BYTON unveiled the M-Byte electric SUV's huge 48-inch display screen here. This past July, that company filed for bankruptcy.*

*"Faraday Future revealed the FF 91 at CES in 2017, what the company called "the first of a new species," but in December it got a notice from Nasdaq that it had failed to maintain a minimum closing share price of \$1.*

*"Fisker's EMotion impressed conference goers in 2018 with a claim the electric roadster could charge up to 125 miles (201 km) of range after only nine minutes of being plugged in. That did not happen, the \$129,000 car is not in production and, this month, Fisker named its third chief accounting officer since October."*

*As reported in AUTOMOTIVE NEWS EUROPE, January 11, 2024 - CES 2024: [Exhibition of failed ideas offers a warning.](#)*

jobs.” This is certain to happen in the U.S., where strong (political, not consumer) support for BEVs started during the Obama years, and then was picked up again in the Biden years. Before the election, which looks like it will pit the “former guy” against the “current guy”, the Democratic Party is going to have to start to do some serious backtracking on the entire automotive industry issue. The UNITED AUTO WORKERS union endorsed Joe Biden in 2020, but its support in this coming election is not guaranteed. It will hinge on whether job-killing BEVs are still on the policy page for the Democrats.

It’s more difficult to foresee what might happen in Europe as Chinese cars from BYD, SAIC, and GEELY start pouring into the EU’s ports – and arrive increasingly on freight trains using rails built as part of China’s *Belt and Road* initiative specifically for the purpose of delivering big products like cars and trucks to European markets. Chinese-made BEV cars market share has risen to 8%, with prices that are 20% less on average compared to EU-made models.<sup>9</sup> In October 2023, the EUROPEAN COMMISSION initiated an investigation into whether Chinese automobile makers are benefitting unfairly from subsidies from the Chinese government, and if so, whether to levy punitive tariffs on BEVs coming into the EU from China. EC investigators travelled to China in January for an inspection tour. At the same time, China opened its own investigation into brandy dumping by France, which is a major automotive country and brandy producer, and which backs the investigation. China’s support for Russia in its invasion of Ukraine has strained relations between the EU and China, but it is difficult to see the EU going as far as the U.S. on restricting China’s access to the EU car market, especially when it is a U.S. car manufacturer, TESLA, that is leading the charge with cars produced in China.

Nevertheless, the topic of incentives for buying BEVs is already starting to be discussed in the run-up to elections in car-making countries. Swedes were listening carefully when the leader of the opposition party, the Social Democrats, which has currently more than 30% of voter support, admitted that during the eight years it was most recently in

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<sup>9</sup> <https://www.reuters.com/business/autos-transportation/eu-investigators-inspect-chinas-byd-geely-saic-ev-probe-source-2024-01-12/>

charge, 2014-2022, it should not have agreed with its coalition partner, the Green Party, to subsidize BEV buying. That policy was not consistent with its Social Democratic roots, it declared, and neither is TESLA's continued refusal to agree to signing a collective bargaining agreement in Sweden.

I will revisit this topic on a regular basis during the year, and I will follow the course of the elections and their fallout on the automobile industry. On the 20<sup>th</sup> of January 2025, one year and one day from when I am typing this sentence, there will be a presidential inauguration in the U.S. Much of what happens after that will be determined by who gives the inaugural address on that day.

### **Epilog: We need a new Bretton Woods, not more COPS**

As I wrote about the state of the automobile market, I kept having the feeling that I was sweeping up crumbs in the corner of a very large room, that we are in a very messy situation because there are so many parts that are outside of any one group's control. Right now, I do not see how we could ever achieve a good outcome that would satisfy both producers and consumers, and at the same time would move the transport sector further along toward net zero emissions, as long as we continue to muddle along as we have been doing since we discovered that humans affect the environment, somewhere around the end of the 1960s. It's all been so ad hoc. We really do need to get a better grip on this whole thing. We need to get back to the basics, which are mostly economic, but which have a social and general welfare context.

The UNITED NATIONS has done a world of good since its founding in 1945, especially in the areas of establishing global standards for telecommunications and transport, and providing assistance to large numbers of people in need. However, it has not achieved the first of its principal purposes as stated in the first sentence of its first Article: to maintain peace and security (See sidebar). Granted, we have not had an apocalyptic world war, but we have hardly had "peace and security". If the UN cannot stop Russia, a permanent member of its Security Council, from destroying its neighboring country of Ukraine, killing its citizens, kidnapping its children, and threatening to do the same to any other country it decides it wishes to control, it can hardly be



#### *The United Nations Charter*

*Article One: The Purposes of the United Nations are:*

*To maintain international peace and security, and to that end: to take effective collective measures for the prevention and removal of threats to the peace, and for the suppression of acts of aggression or other breaches of the peace, and to bring about by peaceful means, and in conformity with the principles of justice and international law, adjustment or settlement of international disputes or situations which might lead to a breach of the peace;*

*To develop friendly relations among nations based on respect for the principle of equal rights and self-determination of peoples, and to take other appropriate measures to strengthen universal peace;*

*To achieve international co-operation in solving international problems of an economic, social, cultural, or humanitarian character, and in promoting and encouraging respect for human rights and for fundamental freedoms for all without distinction as to race, sex, language, or religion; and*

*To be a centre for harmonizing the actions of nations in the attainment of these common ends.*

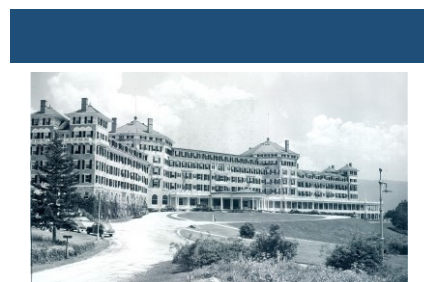


said that it is fulfilling its second purpose, to “develop friendly relations among nations based on respect.” How can it possibly hope to “achieve international co-operation in solving international problems” if it cannot serve the most important of its primary purposes. It seems that its Secretary General is putting all of his energies into global warming because the UN has been sidelined in all activities regarding keeping the peace. The main tool it is using with its climate initiative is the same tool it has used for peace keeping: cajoling. And it has proven to be as ineffectual in getting the parties to cooperate on the climate as it has been on getting them to respect their neighbors’ integrity.

It is time that the world looks for new answers, and it could start with what was a good initiative at the time, in July 1944, while World War II was still raging (the Battle of the Bulge had not yet been fought): the *Bretton Woods Conference*. Its purpose was to establish the foundation for the regulation of the international monetary and financial order at the conclusion of WWII. The organizers of the Conference that was held in the Mount Washington Hotel in Bretton Woods, New Hampshire, wanted to avoid the post-WWI difficulties that resulted in the Great Depression and set the stage for WWII. They felt they needed to be prepared to begin the long road to reconstruction and recovery as soon as the war ended.

Germany, Japan, and Italy were not in attendance, for obvious reasons (although Italy had capitulated in September of '43). Governments in exile, including France, Belgium, The Netherlands, Luxembourg, and Norway, were invited to send delegates. The Soviet Union and Republic of China (not including the Communists), allies of the Allies, were represented. Neutral countries, Sweden, Spain, Ireland, Portugal, and Switzerland, were excluded. There were 730 delegates from 44 countries who were there at the invitation of the United States and the United Kingdom, the principal organizers of the conference.

After twenty-one days of discussions, the conference attendees produced the *Articles of Agreement for the International Bank for Reconstruction and Development* (which later become part of the *World Bank*) and the *International Monetary Fund (IMF)*. These institutions are with us to this day. Along with the *General Agreement on Tariffs and Trade (GATT)* that



*The Mount Washington Hotel in Bretton Woods, New Hampshire where the Bretton Woods Conference was held.*

was added in 1947 as a replacement for the more ambitious proposal by Britain's John Maynard Keynes, its lead negotiator, for an International Trade Organization, provided the framework for a war-ravaged world to experience two decades of growth that no one could ever have imagined. The *World Trade Organization (WTO)* largely replaced *GATT* in 1995. These institutions are not perfect, but they do what they have to do, and have kept the basic economic functions turning for the past seventy-five years, in spite of the breaches of peace and security.<sup>10</sup>

We can do it again with the climate. Close down the secretariat for the *UN Framework Convention on Climate Change (UNFCCC)* and scrap the Conference of the Parties (COP). They are taking us nowhere and are costing a fortune. Re-convene Bretton Woods to create the *Articles of Agreement for the World Climate Bank*. Essentially, start over. Give the task of organizing *Bretton Woods II* to the U.S. and China, the two countries that are responsible for most of the past and the present greenhouse gas emissions. Put them in charge of organizing the conference and seeing to it that the *Articles of Agreement for the World Climate Bank* are written and agreed to. Then let them do their work, like the *IMF*, *World Bank*, and *WTO* do their work.

That's my suggestion.



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<sup>10</sup> The world is significantly different from the time when the Bretton Woods institutions were established. There was a gold standard then. There was no Euro and no China. There was no Internet. Japan and Germany would become economic powerhouses, and deregulation and derivatives and were not even dreamed of. And yet, the institutions that were established in 1944 have survived and adapted.

## THE DISPATCHER

Mobility Industry Insights by  
Michael L. Sena  
February 2024  
Volume 11, Issue 4

*The topics covered in Dispatch Central are newsworthy, but I leave it to others to deliver them “as they break”. I give them a little time to settle in, and try to provide an analysis of their impact.*

### **NHTSA has finally stood up to Tesla**

I BEGAN WRITING “finally caught up to TESLA,” but NHTSA has been hanging on to TESLA’s neck for years, ever since TESLA starting offering its so-called Autopilot feature. It’s like a defender in American football making a high tackle from behind. A runner with strong legs can drag him all the way into the end zone unless the defender slips down to the runner’s ankles and trips him up, or gets help from his teammates. NHTSA got a good hold on TESLA in February of this year. It forced TESLA to recall all 363,000 of its vehicles on the road with Full Self-Driving when it found that the cars would violate traffic laws, including travelling through an intersection while in a turn-only lane, entering a stop sign-controlled intersection without coming to a complete stop, proceeding into an intersection during a steady yellow traffic signal without due caution, and not responding to changes in speed limits.<sup>11</sup> TESLA agreed to make an over-the-air (OTA) update to fix the problems, but claimed that it did not agree with NHTSA’s analysis (continuing its *Never admit you are wrong even when you are wrong* policy). Nevertheless, NHTSA concluded that its tests “led to an unreasonable risk to motor vehicle safety based on insufficient adherence to traffic safety laws.”

#### ***Will an OTA Software Update Really Fix the Problem?***

*There is no guarantee that simply updating software will truly fix the problems. If they would, Tesla would have made them long ago, says Raj Rajkumar, professor of computer engineering at Carnegie Mellow University.<sup>12</sup> Many of those cars rely only on cameras and AI, said Rajkumar, and “cameras can miss a lot of*

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<sup>11</sup> <https://www.pbs.org/newshour/nation/regulators-force-tesla-to-recall-363000-full-self-driving-vehicles>

<sup>12</sup> Ibid.

*things.” My own research and work with OTA updates has identified other problems with remote OTA updates, not the least of which is ensuring that the updates reach every vehicle and that the OTA process, once started, is completed correctly.*

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NHTSA continued with its analysis after the February recall, studying reports of approximately one thousand accidents involving Autopilot and its Autosteer function, some of which were deadly. On the 13<sup>th</sup> of December, it announced that it had forced TESLA to recall 2 million of its cars with Autopilot to limit the use of Autopilot. NHTSA said the Autopilot system “can give drivers a false sense of security and be easily misused in certain dangerous situations when Tesla’s technology may be unable to safely navigate the road.” The recall covers all of the vehicles TESLA has sold in the U.S. produced between the 5<sup>th</sup> of October 2012 and the 7<sup>th</sup> of December 2023.

Once again, this recall will be addressed by an over-the-air software update. NHTSA’s instruction to TESLA is that the update should give drivers more warnings when they are not paying attention to the road while Autopilot’s ‘Autosteer’ function is turned on. Those notifications are intended to remind drivers to keep their hands on the wheel and pay attention to the road. Autopilot should more routinely check on the driver’s attention level, and should disengage when it senses that the driver is not paying attention, when the car is approaching traffic controls, or when it is off a controlled access highway. TESLA’s owner’s manuals states the following: “Autosteer is intended for use only on highways and limited access roads with a fully attentive driver.” However, there is nothing preventing the function from being used on any and all roads or the driver being totally inattentive.

I am not alone in my concern about TESLA’s OTA approach. William Wallace, Associate Director of Safety Policy for *CONSUMER REPORTS*, says that CR has begun to evaluate the OTA fixes, but that their preliminary tests “suggest that the fix is insufficient, with the software not going far enough to prevent misuse or driver inattention”.<sup>13</sup> He gives an example: CR’s testers were still able to use Autopilot after covering the

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<sup>13</sup> <https://edition.cnn.com/2023/12/29/opinions/tesla-autopilot-recall-safety-wallace/index.html>

in-car camera, and drivers can still use the feature if they are looking away from the road. Wallace says that “it is essential for TESLA and NHTSA to actually address the serious safety issues at hand by ensuring that Autopilot can be used only in situations for which it has been designed, such as limited-access highways, and only when the system has verified that the driver is paying attention to the road. “It’s alarming,” Wallace says, “that the recall might not work effectively in its current form.”

*It’s been less of a Tesla free-for-all in the EU*

Most of the news services reporting on NHTSA’s recall of almost all *Teslas* ever sold in the U.S. included a reference to the situation in Europe. They quote a spokesperson for THE NETHERLANDS VEHICLE AUTHORITY, presumably because TESLA has obtained Whole Vehicle Type Approval in The Netherlands which applies to all 27 countries within the EU as well as other countries in Europe that submit to the EU Type Approval procedures. He says that *Teslas* will not be recalled in Europe because Autopilot-equipped Teslas do not perform in the same way as in the U.S. TESLA has modified some functions and disengaged other functions to “comply with United Nations standards”. However, he does not explain what those standards are. I will.

I have written about this topic extensively in previous issues of *The Dispatcher*. Please see the lead article in the May 2022 issue, The Legal Framework for Driverless Cars Already Exists (<http://www.michaellsena.com/the-dispatcher-news-letter-2/> and scroll down to May 2022). In summary, EU Type Approval for the steering function in vehicles is based on UNECE Regulation 79. The Regulation is very detailed and very restrictive. It does not allow most of the functions in Autopilot. In addition, in the EU Type Approval process, anything that is not covered by a regulation is NOT PERMITTED, as opposed to what appears to be the case in the U.S., where anything that is not specifically prohibited by the Federal Motor Vehicle Safety Standards is allowed as long as it does not conflict with State regulations. Hands-free steering is not permitted under UNECE Reg 79, although it is covered by UNECE Reg 157 that is now part of the EU Type Approval regimen. Lane changes are very restricted in the EU and are essentially not operational. (For a detailed description of the European restrictions, see the following



web site: [https://www.teslarati.com/tesla-autopilot-europe-restrictions-explained-video/.](https://www.teslarati.com/tesla-autopilot-europe-restrictions-explained-video/))

This is clearly a case where the U.S. should have taken the UNECE Regulation 79 , as well as all of the other UNECE Regulations, and made them part of the Federal Motor Vehicle Safety Standards (FMVSS). TESLA, and all the other companies placing cars on the roads without hands-on drivers, feel they have a no-holds-barred position in the U.S. – until someone is injured. Then they are eviscerated.

### **A little less bullying and a little more listening**

Elon Musk has a way of cowering opponents, making them feel stupid, inadequate, and even irrelevant. This is what his little game is about with publicly not agreeing with NHTSA’s conclusions, claiming that an OTA is not a recall, but throwing them a bone by making the OTA update. “Okay! Now I did it. Don’t bother me anymore. Can’t you see I’m busy saving the Planet?”

Nevertheless, NHTSA is behaving like an inattentive and overly indulgent parent, and shares responsibility for Musk’s behavior. Put clear regulations in place and make sure that they are followed. Do not allow functions if they are not regulated and tested. Stop the free-for-all. Everyone will be better off if everyone knows and follows the rules.

### **Nikola founder, Trevor Milton, sentenced to jail**

THE OLD SAW, “*If it sounds too good to be true, it probably is,*” definitely applies to the story of NIKOLA CORPORATION, based in Phoenix, Arizona. In the November 2020 issue of *THE DISPATCHER*, I opened a *Dispatch Central* article with the questions: “Is Trevor Milton a visionary automotive entrepreneur or a snake oil salesman?” On the 5<sup>th</sup> of October 2022, a U.S. court decided he was the latter. A Federal court found him guilty of lying to investors about the company’s technology, convicting him of one count of securities fraud and two counts of wire fraud. Prosecutors, who asked for an eleven-year sentence, (similar to the one given to Elizabeth Holmes, founder of THERANOS, who was also convicted of lying to investors) said that he misled investors by stating that NIKOLA had built an electric- and hydrogen-powered pickup (called *Badger*, which was cancelled) from the “ground up,” that it had developed its own batteries (even

though he knew he was buying them), and that it had early success creating a “Nikola One” semi-truck that he knew did not work.

*Mea culpa, mea culpa, mea maxima culpa*

Milton was sentenced on the 18<sup>th</sup> of December 2023 to four years in prison. One of the prosecutors said prior to sentencing: “There has to be a message that whether you are an entrepreneur, a startup founder, a corporate executive, when you go out there and talk about your company, you must be honest.” Milton said he didn’t mean to hurt anyone, and that he didn’t intend to deceive customers or investors. The judge, who decided on the sentence, said that Milton’s case was different from what Holmes did because she was lying about technology that affected people’s health, and Milton was lying about technology that affected people’s pocket-books. But he did not believe that Milton acted with good intentions, as he claimed, and even if he did, “the law does not grant a pass for good intentions.”

My November 2020 issue article on NIKOLA wasn’t my first look at the company. I wrote a short piece in January 2020, also in *Dispatch Central*, where I listed three positive traits which I saw in NIKOLA: it was focusing on improving the environmental sustainability of large commercial vehicles; it was developing hydrogen fuel cell technology for this purpose; and, it was incorporating the one part of the electric vehicle solution that most other companies, with the exception of TESLA, had completely ignored: the charging infrastructure. I bought Milton’s story without flying to Arizona and kicking the tires myself. The company went public in March 2020, and by the 9<sup>th</sup> of June its stock was trading at \$79.73/share, giving it a market cap higher than FORD’s. On the 8<sup>th</sup> of September, GM said that it was going to make a \$2 billion investment in Nikola and receive an 11% stake in the company. As it turned out, this was not a cash investment, but payment to GM for GM to manufacture the *Badger* pickup. It already was starting to sound fishy.

Then things started unravelling. On the 10<sup>th</sup> of September, a report by HINDENBURG RESEARCH, a company run by a short seller, alleged that NIKOLA had “promoted proprietary technology that did not exist.” Milton resigned two weeks later, and the *U.S. Securities and Exchange Commission (SEC)* and

the *Department of Justice (DOJ)* opened investigations into NIKOLA's business. A U.S. federal grand jury indicted Milton, but did not indict the company. The indictment charged Milton with three counts of criminal fraud—for "lying about 'nearly all aspects of the business'"—and two counts of securities fraud. The company's stock price dropped to \$12/share. At the end of November 2020, as I reported in the January 2021 issue of *THE DISPATCHER*, GM pulled out of the deal with NIKOLA. In December 2021, NIKOLA CORPORATION agreed to pay \$125 million to settle charges that it "defrauded investors by misleading them about its products, technical advancements, and commercial prospects."<sup>14</sup> The order found that it WAS NIKOLA CORPORATION that was responsible for Milton's "allegedly misleading statements."

#### *Nikola goes on, at least for now*

NIKOLA is still in business, although its shares are trading for under a dollar. It had a net loss of \$425.7 million in Q3 2023, compared with a net loss of \$250 million in Q3 2022. If you look at its web site, it says its hydrogen fuel cell electric vehicle is in production, and that both the FCEV and BEV could be purchased through dealers. I checked locations and found a dealer in Chicago, ALTA, that had the TRE FCEV for sale or lease. We'll see what the future holds for NIKOLA.

### **Expert tips on surviving winter with a BEV**

WE HAVE HAD some pretty cold temperatures in Sweden this winter, and we're not even in the coldest month of February. It seems that the relatively mild winters we have had during the past five years-or-so have lulled some of the younger generation into believing that they are living in California, Florida, or Texas, the states in the U.S. where folks purchase most of the BEVs. "Gosh! I didn't know I would lose half of my range if it gets really cold. Shouldn't someone have warned me? Can I get compensated?"

There was an article in the national newspaper on the 19<sup>th</sup> of January, just ahead of very cold weekend, on how to avoid losing up to 50% of the BEVs range: park in a heated garage; charge before you leave the garage; don't turn on the car's heater, use the seat warmer and steering wheel heater and wear extra warm clothes. Actually, only the last one works.

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<sup>14</sup> <https://www.sec.gov/news/press-release/2021-267>

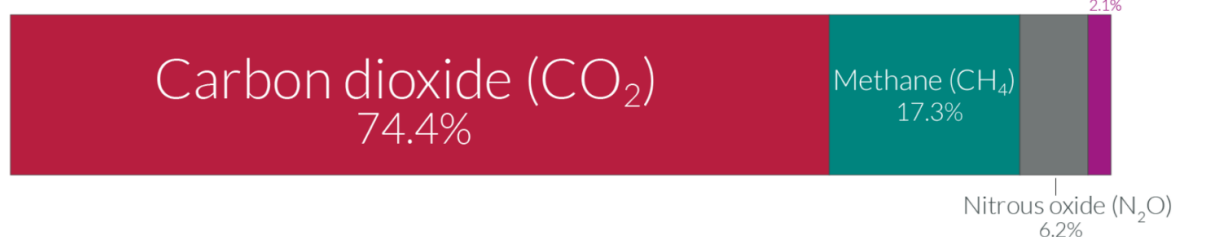
## Net Zero Emissions: Finding the right balance

"Global Net Zero Emissions describes the state where emissions of carbon dioxide due to human activities and removals of these gases are in balance over a given period. It is often called simply **Net Zero**. In some cases, "emissions" refers to emissions of all greenhouse gases, and in others it refers only to emissions of carbon dioxide (CO<sub>2</sub>)."<sup>15</sup>

CLIMATE TALK HAS focused on CO<sub>2</sub>, mostly to the exclusion of the other greenhouse gases (GHGs), such as methane and Nitrous oxide. There are three main reasons for this omission: 1) CO<sub>2</sub> represents almost 75% of GHGs; 2) it stays up in the atmosphere for hundreds of years, compared to around ten-to-twelve years for methane; and 3) there are so many industries and processes that generate CO<sub>2</sub>. Nevertheless, it turns out that we really need to include at least methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) in the discussion.

## Global greenhouse gas emissions by gas

Greenhouse gas emissions are converted to carbon dioxide-equivalents (CO<sub>2</sub>eq) by multiplying each gas by its 100-year 'global warming potential' value: the amount of warming one tonne of the gas would create relative to one tonne of CO<sub>2</sub> over a 100-year timescale. This breakdown is shown for 2016.



OurWorldinData.org - Research and data to make progress against the world's largest problems.

CO<sub>2</sub> in the atmosphere is like salt in our body. Both are good up to a point, and then they are bad. According to the *HARVARD SCHOOL OF PUBLIC HEALTH*, "...salt, also known as sodium chloride, is about 40% sodium and 60% chloride. It flavors food and is used as a binder and stabilizer. It is also a food preservative, as bacteria can't thrive in the presence of a high amount of salt. The human body requires a small amount of sodium to conduct nerve impulses, contract and relax muscles, and maintain the proper balance of water and minerals. It is estimated that we need about 500 mg of sodium daily for these vital functions. The ideal limit is between 1000 and 1500 mg/day. But too much sodium in the diet can lead to high blood pressure, heart disease, and stroke. It can also cause calcium losses, some of which may

Source: <https://our-worldindata.org/greenhouse-gas-emissions>

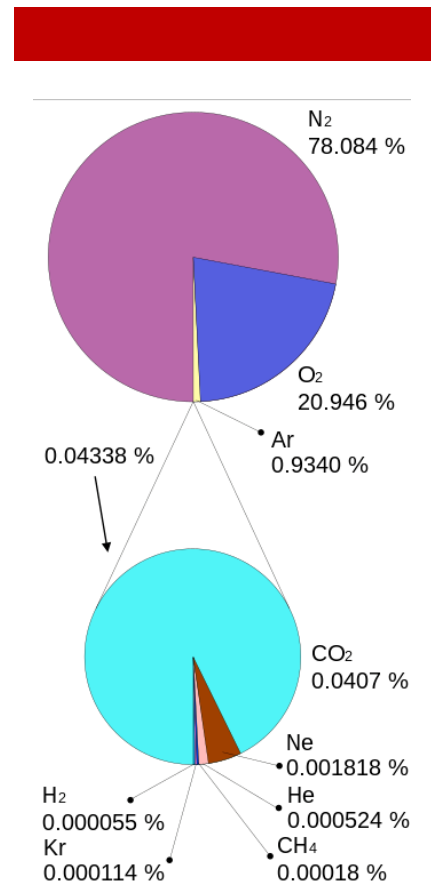
<sup>15</sup> Frankhauser, Sam, et al. "The meaning of net zero and how to get it right". *NATURE CLIMATE CHANGE* 12 (1): 15-21.

be pulled from bone. Most Americans consume more than 3500 mg/day, or one-half teaspoon of salt per day, which contains far more than our bodies need.”<sup>16</sup>

It’s a similar story for carbon dioxide. I turned to the NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) to obtain an unbiased and scientific view on CO<sub>2</sub>. Here what it says about why carbon dioxide matters, both in terms of why we need some of it, and why we don’t want to have too much of it:<sup>17</sup>

*“Carbon dioxide is Earth’s most important greenhouse gas: a gas that absorbs and radiates heat. Unlike oxygen or nitrogen (which make up most of our atmosphere – see diagram right), greenhouse gases absorb heat radiating from the Earth’s surface and rerelease it in all directions – including back toward Earth’s surface. Without carbon dioxide, Earth’s natural greenhouse effect would be too weak to keep the average global surface temperature above freezing.”* Earth’s average temperature without the greenhouse effect would be as cold as -18°C, a staggering 30°C lower than our current average temperature. So Earth would be one, big frozen ball and totally uninhabitable. *“(But) by adding more CO<sub>2</sub> to the atmosphere (than has been put there through normal processes since the time the earth was formed), people are supercharging the natural greenhouse effect, causing global temperature to rise. According to observations by the NOAA Global Monitoring Lab, in 2021 carbon dioxide alone was responsible for about two-thirds of the total heating influence of all human-produced greenhouse gases.*

In summary, CO<sub>2</sub> is derived from both natural and anthropogenic sources, is essential to plant life, and is a key part of Earth’s carbon lifecycle. Natural CO<sub>2</sub> sources account for the majority of CO<sub>2</sub> released into the atmosphere. Oceans provide the greatest annual amount of CO<sub>2</sub> of any natural or anthropogenic source. Other sources of natural CO<sub>2</sub> include animal and plant respiration, decomposition of organic matter, forest fires, and emissions from volcanic eruptions.



Composition of Earth's atmosphere by molecular count, excluding water vapor. The lower pie chart represents trace gases that together compose about 0.0434% of the atmosphere (0.0442% at August 2021 concentrations). Numbers are mainly from 2000, with CO<sub>2</sub> and methane from 2019, and do not represent any single source.

<sup>16</sup> <https://www.hsph.harvard.edu/nutritionsource/salt-and-sodium/>

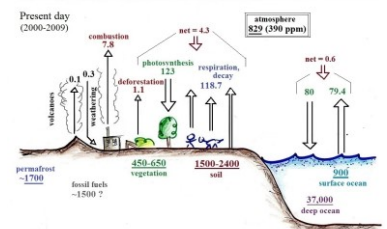
<sup>17</sup> <https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide>



There are also naturally occurring CO<sub>2</sub> deposits found in formation layers within the Earth's crust that serve as CO<sub>2</sub> sources.<sup>18</sup>

So how much is enough or not too much? Atmospheric CO<sub>2</sub> levels of between 280 and 350 parts per million (ppm) created the climate that let humanity build and feed the modern world. The farther we get from those levels, the more we risk disturbing the balance.<sup>19</sup> If they are too low, we freeze, and if they are too high, we boil because too much of the Sun's heat is trapped. Besides needing CO<sub>2</sub> to keep the temperature of Earth livable, plants need CO<sub>2</sub> to grow. They convert water and CO<sub>2</sub> into sugar, and store the carbon in their tissues. Plants also transfer some of the carbon to the soils in which they grow. Before humans started burning fossil fuels, making cement, and cutting down huge amounts of forested land for building and farming, the amount of CO<sub>2</sub> that was released by breathing, outgassing from the ocean, decomposition of vegetation and other biomass, venting volcanoes, naturally occurring wildfires, and even belches from ruminant animals was offset by the so-called "sinks", including photosynthesis by plants on land and in the ocean, direct absorption into the ocean, and the creation of soil and peat. Earth was at Net Zero.

It has been found that plants have been absorbing increasing amounts of carbon in their biomass and growing faster, in effect, helping to slow down global warming. Climate change deniers use this fact – and it is a fact – to claim that Earth will compensate for extra CO<sub>2</sub> that humans have been emitting for the past two centuries. However, plants will reach a limit for how much CO<sub>2</sub> they can absorb.<sup>20</sup> NASA measures the amount of CO<sub>2</sub> in the Earth's atmosphere, and in 2022 it was 417.2 ppm, which is 67.2 ppm over the maximum Goldilocks limit. It is projected to be 419.2 ppm in 2023. The preindustrial level of CO<sub>2</sub> (i.e., the amount in the air a few centuries ago, before humans began to burn CO<sub>2</sub>-pro-



<sup>18</sup> <https://www.netl.doe.gov/coal/carbon-storage/faqs/carbon-dioxide-101>

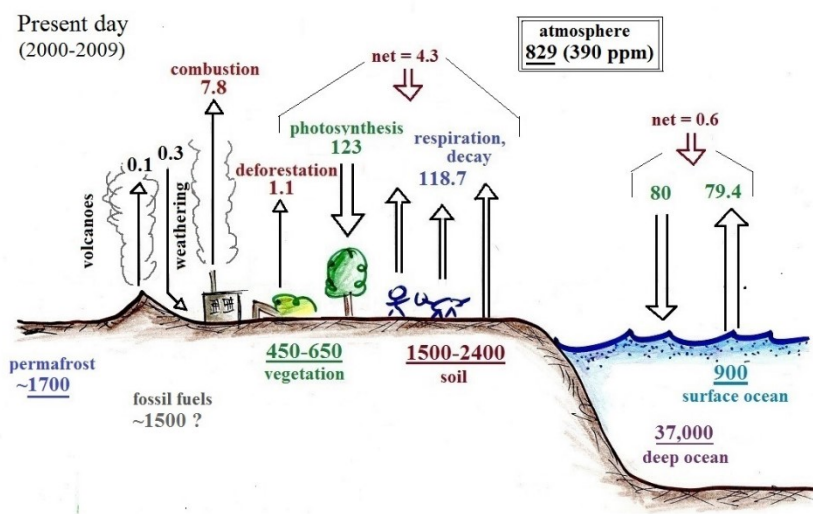
<sup>19</sup> <https://climate.mit.edu/ask-mit/what-ideal-level-carbon-dioxide-atmosphere-human-life>

<sup>20</sup> <https://climate.mit.edu/ask-mit/how-much-human-produced-carbon-dioxide-taken-faster-plant-growth-around-world>

ducing fuels like coal, oil and gas at an industrial scale, cutting down trees, making cement, etc.) was about 280 ppm, which is considered the lower end of the Goldilocks limit. There seems to be general agreement that 280 ppm is the ideal level of CO<sub>2</sub> for human life, since it creates temperature ranges that are comfortable for the human body and allowed civilization to grow. Ideally, we want to get back there. As the diagram below shows, in 2000-2009, the amount of CO<sub>2</sub> in the atmosphere was 390 ppm, and it shows where it came from. From the report: "Compared to the natural processes, (hu)man's contribution is relatively small: about 7.8 units are added during combustion of fossil fuels (and during the manufacture of cement) and 1.1 units are added every year because of deforestation). The rate at which carbon is added to the atmosphere by man is not balanced by an equal rate of removal: about half (4.6 of the 8) units added every year are removed.

This small imbalance (8 - 4.6 = 3.6 units of carbon are added to the atmosphere every year) explains why atmospheric carbon dioxide concentrations are increasing with time.

### The Carbon Cycle<sup>21</sup>

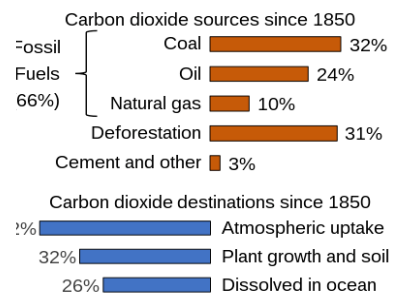


So, to put all of the talk of climate change into the simplest of terms, the 2 ppm of additional CO<sub>2</sub> we will put up into the atmosphere in 2023 (419.2 - 417.2 = 2 – which is less than one-half of what was added in 2000-2009) is the difference between all of the CO<sub>2</sub> natural and anthropogenic sources has

<sup>21</sup>[http://www.atmo.arizona.edu/students/courselinks/spring08/atmo336s1/courses/fall18/atmo170a1s1/lecture\\_notes/1S1P\\_stuff/carbon\\_dioxide/atmos\\_carbon\\_dioxide\\_newest.html](http://www.atmo.arizona.edu/students/courselinks/spring08/atmo336s1/courses/fall18/atmo170a1s1/lecture_notes/1S1P_stuff/carbon_dioxide/atmos_carbon_dioxide_newest.html)



### Excess Carbon Dioxide Emissions



Source: Global Carbon Project

generated during the year minus the amount of CO<sub>2</sub> that is used up as a result of the natural carbon cycle. We add to it when we breath, when plants die, when the oceans do what they do, as well as through fossil fuel burning, by reducing amount of sinks (e.g. through deforestation), and the industrial processes that create CO<sub>2</sub>. We reduce it today through the natural carbon cycle processes. At the end of 2023, we will have added 139.2 ppm to the amount of CO<sub>2</sub> in the atmosphere since 1850, and that is about 89.2 ppm too much, using 350 ppm as the upper limit.

### **Get back to where you once belonged**

Between 1850 and 2019, the Global Carbon Project estimates that about two-thirds (66%) of excess carbon dioxide emissions have been caused by burning fossil fuels. Deforestation, especially reduction of rain forests, has produced 31% of the excess, almost as much as burning coal. A little less than half of the total excess (42%) has stayed in the atmosphere.<sup>22</sup> It is the word 'excess' that causes problems for both climate change deniers and climate change activists. As I explained earlier, the natural carbon cycle generated much more carbon dioxide than the excess sources, but the natural sinks are able to process them without adding them to the atmosphere. Humans' exhalations produce about 4% of CO<sub>2</sub> emissions per year.<sup>23</sup>

The world's population is growing, so our personal emissions will grow. Are we humans excess? I have not seen any proposals for capturing our exhalations at their source, but perhaps that will be a next step. The carbon cycle existed before there were humans, and well before the Industrial Revolution started the process of burning fossil fuels which has led to excess carbon dioxide emissions.

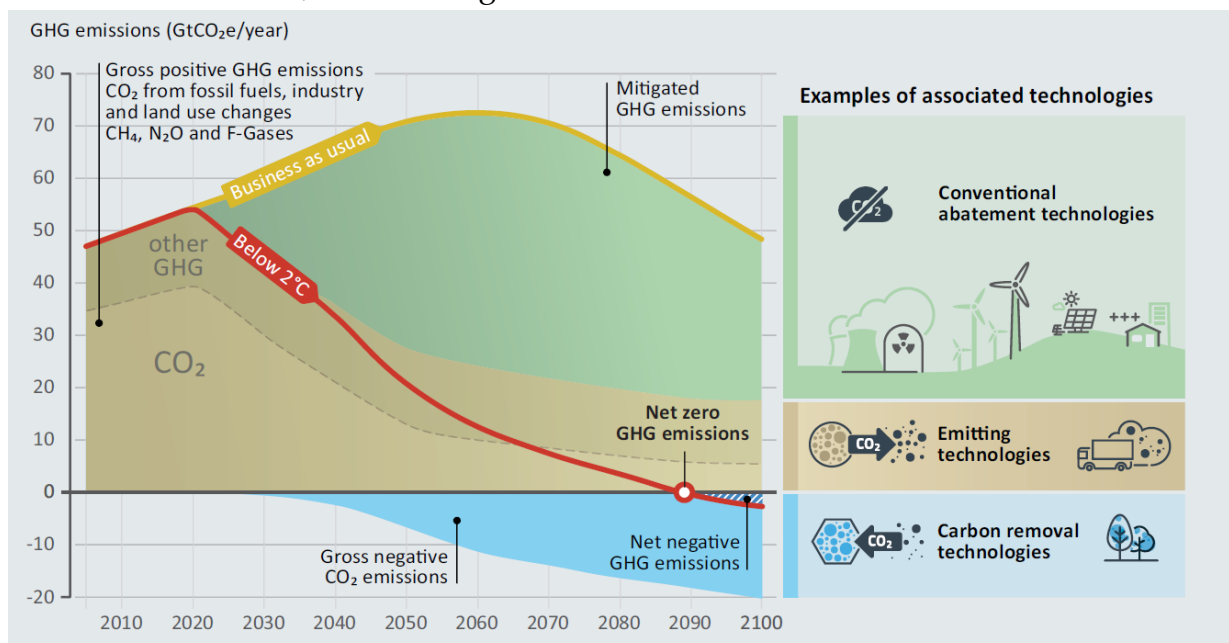
Methane (CH<sub>4</sub>), measured in parts per billion (ppb) is 162% higher than pre-industrial levels. It was 723.5 ppb in 1850, and is now 1,805.7 ppb. We put up 17 ppb in 2021. Although methane remains in the atmosphere for much shorter periods than CO<sub>2</sub>, it is 25 times more powerful at trapping heat.

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<sup>22</sup> [https://en.wikipedia.org/wiki/Carbon\\_dioxide\\_in\\_Earth%27s\\_atmosphere](https://en.wikipedia.org/wiki/Carbon_dioxide_in_Earth%27s_atmosphere)

<sup>23</sup> An average person exhales about 0.66 kilograms of CO<sub>2</sub> in a day, this means that a world population of about 7 billion people will exhale around 1.7 gigatons of CO<sub>2</sub> into the atmosphere each year.

**Net Zero Emissions** is essentially an adult in the room with climate change deniers, climate change activists, and people who have the knowledge and experience to do productive work on climate change issues. The adult in the rooms says we are now going to work together to find the answers to two questions. The first is what do we do to eliminate the 2 ppm of excess CO<sub>2</sub> we are putting into the atmosphere annually? We've already tried spray painting the Mona Lisa and gluing ourselves to roads, so let us move on. The second question is what do we do to eliminate the excess of 17 ppb of methane that we are emitting? Humans and animals breathe and flatulate, so let's not go there.



This diagram created by the *KLEINMAN CENTER FOR ENERGY POLICY* at the UNIVERSITY OF PENNSYLVANIA sums up the problem that Net Zero is attempting to address, and the methods that should be used to achieve a balance that halts global warming and keeps the planet livable, while at the same time keeping civilized life intact. Here is the Kleinman Center's statement on why Net Zero Emissions is a preferred way to proceed to address global warming:<sup>24</sup>

*"In contrast to temperature thresholds (which thus far have been the means of directing policies at both national and international levels), a target of Net Zero Emissions tells policy-makers, business leaders, and the public fairly precisely what needs*

<sup>24</sup> <https://kleinmanenergy.upenn.edu/research/publications/targeting-net-zero-emissions-a-new-focus-for-a-more-effective-climate-policy/>

*to be achieved, and it directly addresses human behavior; something organizations have a better chance to influence than global temperature. A Net Zero Emissions target is more precise, easier to evaluate, politically more likely to be attained, and ultimately more motivating.*

*“Each country’s net emissions must first peak (which is already the case for 49), then continually decrease, and finally attain zero. Measured against this target, it is easy to make mitigation action transparent – not just of national governments, but of cities, economic sectors and individual companies as well. Whoever ignores the target will not be able to deceive others: it is relatively easy to ascertain whether the respective emissions are going up or down.*

This is a report worth reading in full. Net Zero Emissions, thanks to the work of groups like the *KLEINMAN CENTER*, is gathering support. In the 2014 IPCC report, Net Zero Emissions was mentioned 23 times. In the 2022 report, it showed up 1,282 times. It is proving to be both a more ambitious and more pragmatic approach to a 100% reduction of excess greenhouse gas emissions, rather than the loophole-filled approach of country-by-country temperature-based emissions reductions of 80-95%, which have allowed countries to claim that most of their major emissions are in the remaining 5-20% and therefore put off addressing them.

#### *No place to run to; no place to hide*

With Net Zero Emissions as the measuring stick, no country could even consider building a coal-burning electricity generation or heating plant without fitting it with technology that would capture every last milligram of CO<sub>2</sub> without letting it enter the atmosphere. No country would allow its rain forests to be cut down or purposely burned to grow soy beans to feed pigs. No country would even dream about closing its nuclear power plants while it has dirty coal-burning and gas-fired (blood-drenched in the case of gas sourced from Russia) power plants in operation. Instead of wasting billions of dollars and euros building electric charging stations and turning over money to consumers to purchase them, and instead of creating one more gigantic user of electricity that is forcing more countries to burn carbon to produce their electricity, governments should mandate today the sale of only hybrid vehicles. We should have done it twenty years ago – or earlier (see Musings).

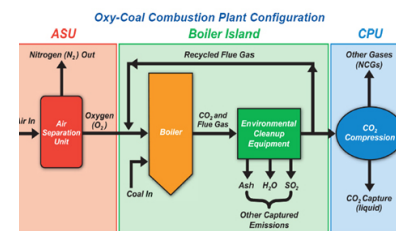


The formula for success as illustrated in the *KLEINMAN CENTER*'s diagram is simple: stop adding and start subtracting. Just closing down coal, gas, and oil will not be enough, and if we focus only on those measures we will also just close down our societies. We must put prophylactics in the form of carbon capture and storage (CCS) on all GHG-emitting sources at the same time as we phase them out in favor of power-generating sources which do not emit GHGs, like wind, solar, and, above all, nuclear. Too expensive? Use all that money we are pouring into BEV charging and tax breaks for buying them. Just a way of continuing to use fossil fuels, as opponents argue? It's past the time for such arguments.

We must stop deforestation. Period. Can that be done by buying carbon credits,<sup>25</sup> like BLUE CARBON LLC of the United Arab Emirates buying 10% of Liberia's land area for 30 years? This particular deal has the smell of burning sulfur about it, but if "sinks" can be preserved by offsetting the phasing out of fossil fuels, it can be a way to get to Net Zero.

And, last but not least, we must start pulling out the excess CO<sub>2</sub> and CH<sub>4</sub> from the atmosphere. We will not get to 350 ppm of CO<sub>2</sub> from 419.2 ppm without carbon removal and storage. It's that extra amount that is causing the problem with global warming, and if we just stop adding, and don't start subtracting, our goose is cooked.

Net Zero Emissions has critics on both sides of the climate debate. That's because both sides ignore the simple fact that fossil fuel burning is a very small contributor to how much carbon dioxide is put up into the atmosphere. If we had listened to the real climate scientists fifty years ago and addressed the entire carbon cycle, instead of concentrating our ears and minds on emissions from just transport, we would more than likely not be in the situation we are today, pushing everyone into electric cars run on electricity principally produced with gas and coal.



<sup>25</sup> Article 6 of the Paris Climate Agreement, reached in December 2015 at COP21, authorized signatory countries to work together to achieve their greenhouse gas emission reduction targets. Put simply, a country reducing its emissions beyond its forecasts can sell its surpluses in the form of credits to a more polluting country, which can use them to offset its own emissions.

## **Volvo Cars is worst in class in rate of return**

The tone of frustration was clearly palpable in each of the three articles which appeared in the Friday, 12 January 2024 issue of *DAGENS INDUSTRI*, Sweden's daily business newspaper. From the time Jim Rowan took over the CEO position of VOLVO CARS from Håkan Samuelsson on the 3<sup>rd</sup> of January 2022, the company's total rate of return has declined 67.4%. That makes it worst among global car manufacturing companies during the same two-year period—21.3% lower than the next worst, FORD MOTOR COMPANY (its former owner).<sup>26</sup> Since there are no dividends distributed by VOLVO CARS, the value is based on the share price.<sup>27</sup> When the IPO of VOLVO CARS was completed in October 2021, its share price was set at 53 SEK (\$5.87). It traded as high as 90.14 SEK on the 14<sup>th</sup> of January 2022 before it began its journey south. On the 11<sup>th</sup> of January 2024, the share price was 30 SEK (\$2.92).

VOLVO CARS has been owned since 2010 by ZHEJIANG GEELY HOLDING GROUP CO., LTD., commonly known as GEELY, which is a Chinese multinational company headquartered in Hangzhou, Zhejiang. It is privately held by Chinese citizen Li Shufu, who recently began referring to himself as 'Eric Li'. GEELY was established in 1986 as a refrigerator maker then motorcycle maker, and entered the automotive industry in 1997 with its GEELY AUTO subsidiary. It acquired VOLVO CARS in 2010 from FORD. In November 2021, Li sold just under 20% of VOLVO CARS in an IPO with the shares listed on the NASDAQ STOCKHOLM stock exchange. In November 2023, Li sold 3.4% of his shares for \$350 million.

Jim Rowan had no real automobile experience when he was chosen by Li to replace Håkan Samuelsson, who had a lifetime of automobile experience before he took the VOLVO CARS position. Rowan had a brief stint as the head of a failed

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<sup>26</sup> Honda (+51.6), Stellantis (+38.5), Toyota (+34.5), BMW (+29.7), Renault (+17.4), and Mercedes-Benz (+2.1) all delivered positive value to shareholders during the period 3 January 2022 and 11 January 2024. Joining Volvo (-64.7) on the negative side were Ford (-43.4), VW (-41.8), Tesla (-41.5), GM (-39.9), and Hyundai (-5.8). Sources: Infront, Bloomberg.

<sup>27</sup> Rate of Return = (End Value of Investment-Beginning Value of Investment/Beginning Value of Investment) X 100.

electric car project at DYSON, a vacuum cleaner manufacturer. It was clear that Li wanted a CEO who would do as he was told and not question Li's decisions, like when Li decided that he would merge VOLVO CARS with GEELY AUTOMOTIVE and move the whole operation to China. That did not sit at all well with Håkan and the idea was dropped. Li wasted no time in showing Samuelsson the door as soon as the IPO was done.

I gave my opinion of what I thought of Rowan's chances for success when he was hired. DI did so as well, and we were on the same page: by the time he learned the ropes, the company would be unrecognizable, if it still existed. Rowan said at the time he was hired that he would continue to reside with his family in Singapore and commute to Göteborg. I worked for VOLVO as an employee and consultant for almost thirty years. I have seen CEOs come and go. You don't run the proud company in Göteborg that helped to build Sweden by remote control from Singapore, Hangzhou, or Detroit. While the *DAGENS INDUSTRI* journalists writing the articles were not directly calling for Rowan's replacement in favor of a CEO who had a better chance of successfully running the company, they all called on the company's board of directors to do something before it was too late.

*The list is long; the chances for change are small*

What is wrong with VOLVO CARS that needs to be put right? Here are the main points listed by the DI journalists along with my comments:

*Volvo Cars is considered to be a Chinese company*

That wasn't a problem during the first half-dozen years following GEELY's acquisition. Li Shufu's bid to buy Volvo from FORD was supported by Hans-Olov Olsson, a highly respected former CEO of VOLVO CARS. I worked as project manager for the introductions of *Volvo On Call* in North America and China simultaneously between 2012 and 2014, so I had a good sense of what was happening in the company. The feeling was that Li was going to invest in VOLVO CARS and bring it to the top of the luxury class of cars globally. There were no competing brands at that time, like *Polestar*, *Lynk&Co*, and *Zeekr*, and Li had not yet made his investment in DAIMLER and started JVs with all manner of companies. It was when Li made a major investment in AB

*Volvo* in 2018 that the warning bells started to ring and people began to wonder what was going on. Then there were all types of strange moves that seemed to be purely based on pulling as much value out of VOLVO CARS as possible, including finessing it out of its 100 years of ICE technology and leveraging that into a JV with RENAULT.

It looks to many like Li is using VOLVO like a cash cow, milking it for all that it is worth and taking the money back to China, not so different from exploiting lithium mines in Africa or buying up airports and ports in Greece. The frosty relationships between China and both the EU and the U.S., two important markets for VOLVO CARS, is a problem for VOLVO.

[Volvo Cars owns a large share of Polestar](#)

POLESTAR is an example of a brand that should never have been released from the VOLVO CARS stable. Li made it a separate company, completed a SPAC merger and had the company's shares listed on the NASDAQ exchange. VOLVO CARS and GEELY own 95% of its shares. It is in major need of investment, and with its share price performance worse than VOLVO's, it is increasingly unlikely that it will get the money it needs from outside investors. Building a separate organization with expensive headquarters is a huge waste of resources that neither VOLVO CARS nor GEELY have. In my opinion, the company should be internalized by VOLVO and its models and sales added to VOLVO's.

[Li owns too much of Volvo's stock](#)

Even after Li sold shares this past November, he continues to own close to 80% of VOLVO's shares. The so-called "free float" of 20% is too small to attract portfolio investors, who believe it should be at least 40-45%. The problem for Li is that if he sells more shares he will lose control of the company. New board members will have to be appointed who will not follow the party line (whatever party is setting the lines). Li wants to both eat the cake and have it, but that never works.

[Geely is still operating in Russia](#)

Chinese car companies, including GEELY, rushed in where European, U.S., and Japanese companies feared to tread after Russia's brutal invasion of Ukraine, its continued killing of its citizens and wanton destruction of everything it can bomb. GEELY's Russian distributor has increased 2022 net

profit by 5000%, according to one of DI articles. Ukraine has publicly stated that GEELY is a war sponsor.

[Volvo Cars was overvalued from the start](#)

According to Daniel Schwarz of STIFEL, a German brokerage and investment banking company, VOLVO CAR'S introduction at a higher valuation than other European companies, like BMW and MERCEDES-BENZ, was based on "flimsy" premises. It had a lower profitability and worse cash flow. Its current price is more a reflection of its real value, he said. Investors feel that the company is too small to be a winner in the race to total electrification. This has been exactly my point when I have criticized GEELY for calving new brands and starting new companies, instead of concentrating investments in VOLVO.

[The company lacks both management direction and vision](#)

Li Shufu doesn't show up for board meetings, in spite of the fact that he Chairman of the board. The board is made up of appointees who have no reason to question Li's decisions, and no power to overrule him.

### **Even good news is not really all that good**

On the 5<sup>th</sup> of January 2024, VOLVO CARS put out a press release announcing that it had set a new global sales record of 708,716 cars during 2023, an increase of 15% over 2022. It sold 113,419 BEVs, an increase of 70% over 2022, and 152,561 plug-in hybrids, a 10% increase over the previous year. BEVs represented 16% of its sales, and BEVs plus plug-ins accounted for 37.5%, but that still left 62.5% of its sales as ICE, a technology it no longer owns. Europe is its largest market, with 42% share, followed by China with 24%, and the U.S. with 18%. What this announcement doesn't say is that VOLVO'S numbers are only slightly higher than what they were in 2019, before COVID-19. It had been on track to meet its 800,000 sales target by 2020, which it had set when Håkan Samuelsson was hired. Then they got off track.

In March of '21, apparently as part of its IPO push, it announced it would be all electric by 2030. That might have sounded good then, but it isn't sounding so good now, with BEV sales stalling everywhere. Combine this with all of the other issues that are weighing down its stock, and prospects for a bright and shiny future filled with VOLVO BEVs do not look all that bright and shiny.



## Crew Comments

### Views on the product returns

In the Musings section in the January 2023 issue, I wrote about the impact that unrestricted product returns is having on increased traffic congestion and exploitation of large tracts of land for reverse logistics handling facilities. The day after Christmas, an article appeared online in CNN Business titled: "Free returns are going away". Here is a brief summary of what it says. It opens with the following statement:

"Americans have grown accustomed to free returns, but a growing number of retailers are charging fees as returns squeeze retailers' bottom lines."

According to the logistics company that makes a living on returned products, HAPPY RETURNS, 81% of merchants are now charging a fee for at least some methods of returns. AMAZON has started to charge customers \$1 if they don't take them to one of its physical stores, WHOLE FOODS or AMAZON FRESH, or to its partner KOHL'S. MACY'S ABERCROMBIE, J. Crew, and H&M are all adding shipping fees for mail-in returns.

According to the NATIONAL RETAIL FEDERATION, customers sent back 17% of the total merchandise they purchased in 2022, totaling \$816 billion, up from 8% in 2019. An 11 January 2024 NEW YORK TIMES article by Pamela Paul, titled "When You Return Those Pants, There's a Price You Don't See", stated that "online returns create 16 million tons of carbon emissions, or the equivalent of 3.5 million cars on the road for an entire year. (Ms. Paul didn't say whether these were ICE, BEV, or Hybrid, but she probably would think such as question was nitpicking.)

So it looks like my article got folks thinking about this issue and now, maybe, we will see a lot of good things happening. I have one suggestion. All companies selling wearable products, such as shoes, shirts, pants, and dresses, should adhere to standard sizes that are fixed globally, and before anyone is allowed to order a wearable product online they have to verify that they have measured themselves using the standards. I wonder how a NO RETURNS policy would work.



### Wisdom, Beauty, Fortune

At a meeting of the college faculty, an angel suddenly appears and tells the head of the philosophy department: "I will grant you whichever of three blessings you choose: Wisdom, Beauty – or ten million dollars."

Immediately, the professor chooses Wisdom.

There is a flash of lighting, and the professor appears transformed, but he just sits there, staring down at the table. One of his colleagues whispers, "Say something."

The professor says, "I should have taken the money."

Cathcart, Thomas and Klein, Daniel. [Plato and a Platypus Walk into a Bar: Understanding Philosophy Through Jokes.](#) PENGUIN BOOKS (2007)

If he had chosen either Beauty or Fortune, he would never have been the wiser nor had any regrets. Something to think about the next time you are tempted to click on a link to a Mensa IQ test.

# Musings of a Dispatcher: Hybrid Dreaming

## THE DISPATCHER

Mobility Industry Insights by  
Michael L. Sena  
February 2024  
Volume 11, Issue 4



*The Columbia Electric Dos-A-Dos Mark VI with Mrs Hayden Eames at the tiller, Hartford, 1900.*

*The 1900 Lohner-Porsche "Chaise" with two front-wheel-hub-motors was the young Ferdinand Porsche's first battery electric vehicle prototype, designed for Jacob Lohner*

### ***It's still not too late to correct our course***

PROSELYTIZERS OF THE second coming of battery electric vehicles (BEVs) have made stories of electric cars' first incarnation an important part of their narrative. They were greatly preferred over smelly, noisy, and hard-to-start gasoline-powered internal combustion engine (ICE) conveyances, they say. There seems to be ample empirical evidence for this claim. The 1899 U.S. census recorded a total automobile production of 1,575 battery electric vehicles, 1,681 steam-powered vehicles (SPVs), and only 936 internal combustion engine (ICE) vehicles.<sup>28</sup> In 1897, the Hartford, Connecticut-based POPE MANUFACTURING COMPANY'S *Columbia Motor Carriage* (shown left), which ran on battery power, was the best selling vehicle in the U.S.

As we know, internal combustion engine cars caught up to and overtook electric vehicles, principally because the availability of electricity had not moved beyond the limited areas in and around cities quickly enough to counter the invention of the electric starter and the flood of inexpensive cars flowing out of Henry Ford's factory.



What is left out of this BEV-friendly narrative is that it wasn't just a battle between electric and steam on

<sup>28</sup> <https://www.tomtom.com/newsroom/explainers-and-insights/evs-were-outselling-gas-cars-100-years-ago/>

one side and internal combustion engine vehicles on the other. **Hybrid vehicles**, running on both battery power and combustion engines, were definitely in the competition mix almost right from the start, and automotive legend, Ferdinand Porsche designed what is believed to be the first one.

Ferdinand Porsche, born in 1875 in what is now Vratislavice nad Nisou, Czech Republic, which was then part of Austria-Hungary, the son of a carriage body mechanic, had apprenticed at BELA EGGER & CO. ELECTRICAL COMPANY in Vienna starting at the age of 18. It was there that he built the first electric wheel-hub motor based on the design of American inventor Wellington Adams. At the age of 23, he moved to JACOB LOHNER, a coach builder. He was employed specifically to develop electric powertrains for the LOHNER coaches. His first prototype was the two-passenger BEV called *Chaise*, (shown above).

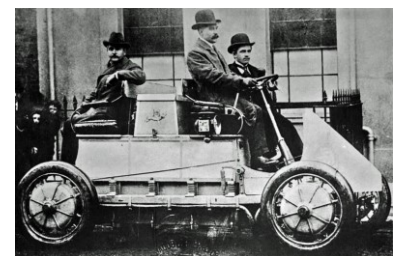
The *Chaise* was big news at the time, especially at the *Paris World's Fair* in 1900. It was a two-wheel drive, battery-powered electric vehicle. The motors were hub-mounted on both of the front wheels. Due to the fact that the motors were on the wheels, it had an extremely low-friction drivetrain. Each internal-pole electric motor produced 2.5-3.5 horsepower (1.9-2.6 kW), with short burst horsepower peaking to 7 hp (5.2 kW). Double the numbers for the total available on the *Chaise*. Just by way of comparison, today's PROTEAN ELECTRIC's in-wheel motors (shown right) each delivers 75 kW, and with two them they combine for 150 kW.<sup>29</sup> This is approximately the same torque as is available in a conventional ICE vehicle.

#### *From pure BEV to hybrid*

One prospective *Chaise* customer named E.W. Hart, who was a coachbuilder like Lohner, wanted to buy a few *Chaise* vehicles, but he asked for modifications. He wanted a four-passenger vehicle that was capable of running on gasoline/petrol as well as electricity, and which had power on all four wheels. Young Ferdinand proved up to the task and delivered his creation personally. Hart gave it the name *La Toujours Contente*, which translates from French as "always



*Protean Electric's in-wheel motor*



*La Toujours Contente (French for "always satisfied")*

<sup>29</sup> PROTEAN ELECTRIC is a UK-based automotive technology company founded in 2009 specializing in in-wheel motor technology.

satisfied". It was a monster (shown right), carrying a 44-cell 80-volt lead-acid battery weighing 1.8 tonnes. The four electric motors on each of the vehicles' wheel hubs weighed a total of 1,280 pounds. Total weight for the car was over four tonnes (8,900 pounds; a 2024 *Chevy Suburban* tips the scales at 6,121 lbs.). It delivered 56 hp, and when totally charged, it could run for 64.3 kilometers (40 miles) on its electric motors. Most important was the brilliant idea that you didn't need to worry about the battery running out of power because you brought along your own portable recharging station in the form of a gasoline-powered motor.<sup>30</sup>

How did it work? The vehicle's internal combustion engine ran at a constant speed to turn a generator and charge the vehicle's batteries. This is called a 'series hybrid'. The batteries delivered electricity to the wheel-hub motors, and they ran until the battery was depleted or more power was needed. Then the gasoline engine turned on to power the generator. There was no gearbox, no drive shafts, chains, or clutch required, thereby eliminating most of the mechanical friction and allowing the vehicle to use over 80% of the energy that it produced to drive the vehicle. With all four hub motors it could reach a top speed of 112.3 kilometers per hour (70 mph).<sup>31</sup> This is 1900, three years before the *Mercedes-Benz Simplex* 60 hp, considered the fastest car at the time, clocked in at 73 mph.

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*For some reason, neither Lohner nor Porsche sought patents for their BEV or hybrid designs. In 1905, German inventor Henri Pieper applied for and received a U.S. patent for his hybrid design, which was granted in 1909. Pieper's design was closer to the hybrid designs of today, referred to as "parallel hybrids", which use both the ICE and BEV parts to power the vehicle, switching between the two modes. The Porsche design was a "series hybrid" in which the combustion engine powers a generator and sends current to the electric motors that move the car.*

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Not only was *La Toujours Contente* the first gasoline-electric hybrid, but it was one of the earliest examples of in-wheel motor power. Porsche followed it up with the *Semper Vivus*



*The Semper Vivus (Latin for 'always alive') was the first series production hybrid automobile.*

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<sup>30</sup> <https://www.hemmings.com/stories/2013/08/15/cars-of-futures-past-1901-lohner-porsche-semper-vivus-and-mixte>

<sup>31</sup> The following sites provided the information for this section: <https://auto.howstuffworks.com/fuel-efficiency/hybrid-technology/first-hybrid-car.htm>; (<https://newsroom.porsche.com/en/products/taycan/history-18563.html>)



design, and a year later Lohner-Porsche had a production version ready, which they called the *Mixte*.

#### *Porsche-designed hybrids were not alone on the roads*

In 1916, a company called WOODS MOTOR VEHICLE COMPANY sold its first *Woods Dual Power*, a gasoline/electric hybrid with a CONTINENTAL-supplied gasoline engine and a GENERAL ELECTRIC-supplied electric motor that had 6 HP and a top speed of 35 mph. The company advertised it as a “self-charging, non-stalling, two-power car with unlimited mileage, adequate speed, and greatest economy.”<sup>32</sup> It worked on battery power alone up to about 15 mph, and then the gasoline motor kicked in. This was intended to use the electric motor’s torque to move the 3,600-pound car off the starting blocks. In spite of being a technical marvel, and being economical to operate (fuel economy of 48 mpg), after two years, WOODS sold only a few of its *Dual Powers*, and went out of business in 1918.

#### *So why didn’t hybrids take off?*

The *Semper Vivus* was a complex piece of machinery, neither easy to produce nor easy to maintain. Its hybrid powertrain had two engines and two generators. Porsche understood this and made major changes to the *Mixte* production version. He replaced the two engines with a single 5.5-liter AUSTRIAN DAIMLER engine mounted in the front of the car and generating 25 horsepower. He replaced the two generators with one and located it under the driver’s seat, and it delivered both supplemental power to the hub-mounted motors and the electric start for the gasoline engine. The *Mixte* was produced until 1915, but it was not a success. Besides its complexity, the biggest reason for its commercial failure was its sticker price: 14,400-34,028 Austrian Krone (\$2,900-\$6,850 in 1901 dollars, equivalent to \$80,000-\$200,000 today). It simply could not compete on price with the simpler BEVs and conventional ICE designs.

WOODS’ *Dual Power* sold for a similar price as *Mixte*, or the equivalent of four *Ford Model Ts*, which went on sale in 1908. Both the *Mixte* and *Woods* had price tags of a luxury car, like



The Woods Dual Power brochure is worth a perusal.

<https://media.hagerty.com/media/wp-content/uploads/2021/08/woodsdualdualpower-brochure.pdf>

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<sup>32</sup> <https://www.hagerty.com/media/automotive-history/it-wasnt-the-first-hybrid-but-the-1917-woods-dual-power-was-an-electrically-assisted-marvel/>



a *Duesenberg* or *Bugatti*, but couldn't come near those cars in speed. The rich were not interested in saving money at the gas pump.

### Fast forward to the 1969

Alternatives to the internal combustion engine were relegated to *POPULAR SCIENCE* and other glimpse-into-the-future magazines until the beginning of environmental awareness grabbed the minds of a few engineers. Some of them worked



at *General Motors Technical Center* in Warren, Michigan, and they managed to convince management to invest in developing a series of mini, two-person "urban" cars. The cars were presented to the public in 1969. The *XP-511* on the left above is a three-wheeler ICE designed by Larry Shinoda, who was better known for his *Corvette* designs. It had a top speed of 80 mph and city fuel economy of 30-35 mpg. On the far right is the *XP-512G*, also an ICE but with four wheels. It has the same body design as the car to its right, the *XP-512E*, which is a pure BEV (also shown right in full color). It had an 84-volt lead acid battery pack that could be recharged from a 115-volt household outlet in 7 hours. It had a range of 58 miles when driven at 25 miles per hour. Its curb weight was 1,250 pounds. (A '69 *VW Beetle* weighed 1,735.)

GM referred to the squarish *GM XP 512H* (second from left) as a "hybrid". Actually, it is a plug-in hybrid. It had a small 200cc engine, along with a DC electric motor and a 72-volt lead acid battery. It operated in pure electric or hybrid mode and, like the *XP-512E*, could be recharged using a standard 115 volt outlet. In pure electric mode it had a range of 5.2



The 1969 GM XP-512E BEV with racing stripe

miles at a sustained speed of 30 mph, while the range in hybrid mode was 150 miles using just three gallons of gasoline (i.e. 50 mpg!). The top speed in hybrid mode was 35 miles per hour. GM produced one of the first production cars with 50 mpg fuel economy, the 1985 *Chevrolet Sprint*. The '95 *Honda Civic* got 47.3 mpg. They were both underpowered and were ICE vehicles. It wasn't until the HONDA and TOYOTA hybrids appeared starting in 2000 that you could combine both fuel economy and performance.

GM quietly dropped the XP experimental program. The U.S. market wasn't ready in 1969 for either alternative powertrains or miniature cars (at least not according to GM), no matter how much fuel they saved. However, the foundations for what would begin to happen in the world of automotive design were beginning to take shape. The ENVIRONMENTAL PROTECTION AGENCY (EPA) was established by President Richard Nixon in 1970 by executive order. In 1973 the first oil embargo sent fuel prices higher and resulted in the U.S. Congress passing in 1975 the Corporate Average Fuel Economy (CAFÉ) standards, which would start the push for total fleet fuel economy for all manufacturers selling their cars in the U.S. This was given further impetus by the Energy Policy and Conservation Act of 1975, which required that average fuel economy of the new car fleet would increase to 27.5 mpg by model year 1985.

#### *Be careful who you don't invite to your party*

In 1993, the newly elected Clinton-Gore administration created what was called a *Partnership for a New Generation of Vehicles (PNGV)*. It was to be a collaboration between the U.S. COUNCIL FOR AUTOMOTIVE RESEARCH, formed in 1992 by President George H.W. Bush, and a collection of universities, national research laboratories, federal agencies, the three domestic automobile manufacturers (GM, FORD, AND CHRYSLER<sup>33</sup>), and suppliers. The goals for this collaboration were to have 80-mpg concept vehicles ready by 1999, followed by "production-feasible" prototypes by 2004.

Three fully operational, full-sized concept cars were produced in 2000. ***They were all hybrids.*** GM created the 80 mpg *Precept*, which used two 35 kW electric motors, one on the

#### *GM Continued to Fiddle*



*"The General Motors EV1 is an electric car produced and leased by General Motors from 1996 to 1999. It was the first mass-produced and purpose-designed electric vehicle of the modern era from a major automaker and the first GM car designed to be an electric vehicle from the outset.*

*The decision to mass-produce an electric car came after GM received a favorable reception for its 1990 Impact electric concept car, upon which the design of the EV1 drew heavily. Inspired partly by the Impact's perceived potential for success, the California Air Resources Board (CARB) in 1990 passed a mandate that made the production and sale of zero-emissions vehicles (ZEV) a requirement for the seven major automakers selling cars in the United States to continue to market their vehicles in California.*

*This car was preceded by the GM Impact, an electric concept car, at the 1990 LA Auto Show. GM preferred a production rate of 100,000 cars per year, rather than 20,000. The car had been developed by electric vehicle company AeroVironment, using design knowledge gained from GM's participation in the 1987 World Solar Challenge, a trans-Australia race for solar vehicles, with the Sunraycer, which went on to win the competition."*

*[https://en.wikipedia.org/wiki/General\\_Motors\\_EV1](https://en.wikipedia.org/wiki/General_Motors_EV1)*

<sup>33</sup> Chrysler merged with Daimler in 1995 to form DaimlerChrysler AG.

front axle and one on the rear axle. The rear axle was connected to a diesel engine capable of driving the rear wheels directly or of generating power for the motor on the front wheels. FORD developed the 72 mpg *Prodigy*, for which few details are available. DAIMLERCHRYSLER produced the 72 mpg *ESX-3*, which had an engine derived from a series hybrid-drive propulsion system which used 40% of the fuel's energy, while the typical car at the time used only 15%. It had two oil-cooled electric wheel motors, and the electric motors were part of the regenerative braking system, where the energy normally lost through disc brakes recharges the battery. All three cars were constructed with lightweight aluminum or thermoplastics, were powered by 3- or 4-cylinder diesel engines, and used NiMH/lithium batteries.<sup>34</sup>

None of the cars made it into production, and the *PNGV* program was cancelled by the younger Bush in 2001, some time after he was inaugurated as President and before the 911 terrorist acts distracted him during the next seven years he was in office. He claimed it was the automakers who pushed him to do it. However, once again, the anti-car critics raised their voices to help kill what would have been a very, very good initiative by the U.S. automotive industry. Ralph Nader (good on safety issues, but, in my opinion, he should have stayed out of the much more complicated topic of powertrain design for minimizing climate effects) said the program was simply transferring the property rights of federally-funded research to the automotive industry, as if the federal government should build cars instead. Climate activists criticised the choice of diesel fuel, and therefore dismissed the entire idea of hybrid vehicles. And *NEW YORK TIMES* journalists used their bully pulpit to argue that the best solution for a fuel-efficient car was no car at all.

Foreign automobile manufacturers were not invited to the *PNGV*. TOYOTA's chairman at the time in 1993, Eiji Toyoda, apparently affronted, decided it was time for TOYOTA to concentrate on producing more efficient automobiles, and he turned to Takeshi Uchiyamada to head up what was called *G21: Global Car for the 21<sup>st</sup> Century*. In 1994, the original goal

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<sup>34</sup> [https://en.wikipedia.org/wiki/Partnership\\_for\\_a\\_New\\_Generation\\_of\\_Vehicles](https://en.wikipedia.org/wiki/Partnership_for_a_New_Generation_of_Vehicles)



DaimlerChrysler ESX-3 Hybrid



Toyota's Prius hybrid debuted in the Japanese market in 1997 with the internal designation NHW10, but a slightly revised NHW11 didn't reach North American shores until 2001.



of 50% efficiency gain was doubled by TOYOTA's engineering executive, Akihiro Wada, and in 1995, the first prototype of the *Prius Hybrid* was shown at the *TOKYO MOTOR SHOW*. In 1996, TOYOTA introduced the *Prius* into the Japanese market so that the car would have some exposure before the United Nations Kyoto Conference on Global Warming that would be held in 1997. It was at this conference that the *Kyoto Protocol* was adopted.

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*The Kyoto Protocol was an international treaty which extended the 1992 UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC) that commits state parties to reduce greenhouse gas emissions, based on the scientific consensus that global warming is occurring and that human-made CO<sub>2</sub> emissions are driving it. The Kyoto Protocol was adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16 February 2005. There were 192 parties to the Protocol in 2020. The U.S. is a signatory, but it has not been ratified by the U.S. Congress. Canada withdrew from the Protocol in 2012.*

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### **Honda and Toyota hybrids arrive in North America**

Honda was first to introduce a production hybrid into the U.S. It was in 1999, and the car was a two-door, two-seater called *Insight* (shown right). It was, in a word, clumpy, but what it lacked in looks, it made up in performance. It had a 1.0-liter, three-cylinder engine that produced 67 HP. The engine was connected to a 2.5-inch electric motor which was linked to a 144-volt nickel-metal hybrid battery pack. It did 0-60 mph in 10.65 seconds (a 1999 *Acura SLX SUV* managed 9.8 seconds). It had a fuel economy of 83 mpg, and emitted 80g/km of CO<sub>2</sub> (a 1999 *Honda Civic* emitted 153 g/km of CO<sub>2</sub>; my 1994 *Volvo 945* that I was driving in 1999 discharged 296 g/km CO<sub>2</sub>). *Insight* had EPA's highest mileage rating ever, which prompted the SIERRA CLUB to give it an award for *Excellence in Environmental Engineering*. It also had an idle-stop feature that automatically killed the engine during traffic jams to stop excessive gas consumption and emit lesser pollutants.



1999 Honda Insight

The *Toyota Prius Generation II* arrived in the U.S. the following year. It was similar to the first version sold in Japan. It wasn't until 2003 that the real *Toyota Prius Second Generation* (XW20) was introduced, the one that we think of when we hear the word 'Prius' (shown right). It was a complete redesign, larger than the original with a more rear-seat legroom, five doors plus a lift-back fifth. It was classified as a SULEV



Toyota Prius Generation II

(Super Ultra Low Emissions Vehicle) and was certified by CALIFORNIA AIR RESOURCES BOARD (CARB) as an "Advanced Technology Partial Zero Emission Vehicle" (AT-PZEV). In 2007, the U.S. EPA and CARB rated the *Prius* as among the cleanest vehicles sold in the United States on the basis of smog-forming emissions.

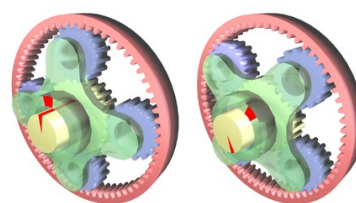
Between 2004 and 2009, TOYOTA sold 1.2 million *XW20 Priuses* worldwide. Between 2010 and 2013, it sold 1.7 million third generation *Priuses* worldwide. During its twenty-five year history, over 6 million *Priuses* have been sold, and TOYOTA has sold an additional 14 million of its other hybrid models, which now include most of its fleet.

TOYOTA's Second Generation *Prius* used what TOYOTA called their *Hybrid Synergy Drive* parallel hybrid system. It had two electric motors and an epicyclic gearset (also called planet gears) that replaced the transmission. As opposed to the series hybrid, in which the engines power a generator, in the parallel design, the internal combustion engine and one or both electric motors deliver power to the wheels under different conditions, such as running on flat terrain or traveling up- or downhill. In the *Prius*, at low speeds or light loads, the engine turns off and one or both of the electric motors powers the vehicle. One of the electric motors performs the function of a generator, capturing braking energy when the car decelerates. The Second Generation had a 1.3 kilowatt-hour capacity nickel-metal-hydride battery that stored the recaptured energy. It had a 1.5 liter engine with 110 HP. Over time, Toyota improved everything on the *Prius*, including its styling.

During William Clay (Bill) Ford, Jr.'s watch as FORD MOTOR's CEO between 2001 and 2006, FORD introduced the *Ford Escape Compact Crossover Hybrid*. It was the first SUV hybrid, beating TOYOTA to the all-wheel drive SUV punch by a model year, 2005 vs. 2006. TOYOTA hybridized its popular *Highlander* in 2006. GM and Chrysler converted some of their models to hybrids, but they did it with little fanfare and very little enthusiasm.

*If I could turn back time; if I could find a way*

Hybrid revival and their arrival in the U.S. at the start of the *New Millennium* should have served as a wake-up call for the automobile industry and the government. Cars that used all



This planetary gear train consists of a sun gear (yellow), planet gears (blue) supported by the carrier (green) and a ring gear (pink). The red marks show the relative displacement of the sun gear and carrier, when the sun gear is rotated 180° clockwise and the ring gear is held fixed.



of the technology that had been developed and perfected for a century, while spewing out one-half the amount of CO<sub>2</sub> compared to the most efficient full ICE vehicles at the time, and used a quarter of the amount of fuel to travel the same distance, should have been seen as a gift from whomever you feel is in charge of miracles. Cher, the originator of the words in the subtitle above, could have driven her *Porsche*, *Jeep*, or *Mustang* with a much cleaner conscience if all the automakers shifted willingly and immediately to the hybrid design, or if governments mandated it. All the money, public and private, that has been spent on developing BEVs and building a BEV charging infrastructure, and all the tax money that has been handed over as subsidies to wealthy car buyers so they would buy BEVs, could have been spent on making higher fuel economy and lower emissions hybrids, funding research to create e-fuels<sup>35</sup> and inventing ways to capture all of the emissions coming from the tailpipes and doing something productive with them.

Sadly, in my opinion, that was not the case. Hybrids became political symbols for lefties and righties alike during the early 2000s. (*Ed. - Progressive and Conservative are the politically correct terms used today. However, I see nothing inherently progressive about Socialism, nor do I see respect for traditional values as an indication that a person cannot appreciate a good idea when he or she sees one.*) Righties liked them because they used less fuel that mostly came from the Middle East at the time. Righties who liked hybrids called themselves “Prius Patriots”. Lefties, especially the Hollywood set who were the first buyers of the high-ticket *Teslas* twelve years later, liked them because it showed their environmental creds to their climate-conscious fan base – or maybe just because it made them look trendy. University professors took to them like they took to *Volvos* in the ‘60s. But *Priuses* were too quiet for the piston heads, and still too polluting for the climate activists. They took Hollywood, Palo Alto, Greenwich, CT and Cambridge, MA by storm, but Detroit not so much.

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<sup>35</sup> Electrofuels, also known as e-fuels, a class of synthetic fuels, are a type of drop-in replacement fuel. They are manufactured using captured carbon dioxide or carbon monoxide, together with hydrogen obtained from water split by sustainable electricity sources such as wind, solar and nuclear power. <https://royalsociety.org/-/media/policy/projects/synthetic-fuels/synthetic-fuels-briefing.pdf>

A few years ago, with TESLA passing one car maker after another in sales on its way to having its *Model Y* being the number 5 best seller and its *Model 3* being the number 13 best seller in the U.S. in 2023, hybrids seemed all but forgotten. But then something happened. In 2023, pure hybrids outsold pure BEVs, not by much, a bit over 1 million compared to a bit under 1 million, but they outsold them. The pace of hybrid sales is around 75% higher than 2022. Based on what I have been able to glean from a variety of sources, including AUTOMOTIVE NEWS, FORTUNE, and CAR AND DRIVER, the reasons for the renewed interest in hybrids boil down to the following: their lower price compared to BEVs, more than \$20,000 less on average; the absence of the “hassle” and difficulties of charging; their high fuel economy compared to pure ICE vehicles, 50-100% better, depending on the model; and, for some, their lower emissions.

These are all the reasons why a bit over one year ago we bought a 2023 *Toyota RAV4 Hybrid* when it was time for my wife to replace her 2006 *Toyota Corolla Verso*. TOYOTA SWEDEN had stopped selling the ICE version because of the draconian purchase and annual taxes levied on them, but we would have chosen the hybrid version in any case. There are many improvements that TOYOTA made in the 2023 version compared to my model year 2015 *RAV4*, but the principal difference is that the 2023 uses half as much fuel as the 2015. At \$6.82/gallon, the current price of gasoline in Sweden, that adds up to a big saving, \$850 per year to be exact. It will be about one-half of that in the U.S. with the average price of regular gasoline at \$3.54 in 2023. Still, it's not chicken feed.

In summary, hybrids just make sense. It looks like more and more people are coming to the same conclusion. We can't turn back time and recover all those unnecessary emissions of greenhouse gases we added to the atmosphere after we had a viable alternative to pure ICE vehicles, but it's still not too late stop wasting electricity and start working on make the ICE parts better in hybrid vehicles.



## About Michael L. Sena

Through my writing, speaking and client work, I have attempted to bring clarity to an often opaque world of highly automated and connected vehicles. I have not just studied the technologies and analyzed the services. I have developed and implemented them, and have worked to shape visions and followed through to delivering them. What drives me – why do what I do – is my desire to move the industry forward: to see accident statistics fall because of safety improvements related to advanced driver assistance systems; to see congestion on all roads reduced because of better traffic information and improved route selection; to see global emissions from transport eliminated because of designing the most fuel efficient vehicles.

This newsletter touches on the principal themes of the industry, highlighting what, how, and why developments are occurring so that you can develop your own strategies for the future. Most importantly, I put vehicles into their context. It's not just roads; it's communities, large and small. Vehicles are tools, and people use these tools to make their lives and the lives of their family members easier, more enjoyable and safer. Businesses and services use these tools to deliver what people need. Transport is intertwined with the environment in which it operates, and the two must be developed in concert.



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