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Telematics Industry
Insights by
Michael L. Sena

THE DISPATCHER

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ITU and UNECE

THE SYMPOSIUM ON THE FUTURE NETWORKED CAR 2022
A VIRTUAL EVENT - 22–25 MARCH 2022.

Moving Towards Automated Driving. *The Future Networked Car Symposium 2022 will examine the latest advances in automated driving, vehicle connectivity and artificial intelligence. With the 2022 Geneva Motor Show once again cancelled, ITU and UNECE have decided that the* ***FNC 2022 Symposium*** *will be totally virtual this year as well. It will be held on four successive days in March, each day consisting of three-hour sessions dedicated to one of four important topics. The first session is on Tuesday, the 22nd, and will provide an overview of what governments and standards bodies are doing. On Wednesday, the 23rd of March, I will moderate a session on artificial general intelligence, a new topic added to the Symposium this year. On Thursday, Roger Lanctot of Strategy Analytics will lead a session on automated driving, and on Friday T. Russell Shields, CEO of RoadDB, leads a session on wireless communications. There is no cost for registration. The complete program can be seen at:* ***Symposium on the Future Networked Car (FNC-2022)***

THE DISPATCHER

Telematics Industry Insights by Michael L. Sena
March 2022 – Volume 9, Issue 04

The Evolving Business of Powering Our Vehicles

Coal bins, gas pumps and charging points

HOW WILL THEY make money setting up and operating electric charging stations? I thought we might start by asking how they made money delivering oats for draft horses, hoisting coal into bins that fed the steam engines, and pumping gasoline (petrol) and diesel fuels into vehicles fitted with internal combustion engines. These weren't set up as charitable or public organizations; business people had to make money on the difference between the price they paid for oats, coal, and petroleum-based fuels and what they could sell it for to those who needed to buy it. The same will be true for delivering electricity to BEVs. If people who bought BEVs thought they were in heaven getting a free ride, the latest electricity prices have brought them down thumping to earth. But are the business models the same? Let's have a look.

Oats, coal, and gasoline are not electricity

Back in the pre-car days, when horses provided the power for land-based transportation, horse fuel was principally oats and hay in those places where natural feeds didn't grow, like in cities. Oats were grown in fields, the kernels were separated from the stalks, the kernels were packed in burlap bags and carted by horse-drawn wagons to places where other horses were working. A feed and grain store owner bought the wagon-load of bags and sold them to horse owners who bought the number of bags they needed. Horse owners placed a few quarts of the oat kernels into a feed bag to keep their horses producing their one horsepower during the day. When the horse was taken to its stall for the night it would have hay and maybe an apple or carrot and some salt.

Whoever decided to go into the oat-selling business for city horses before the turn of the 20th century had to run

the numbers in the same way my father's friend Pee Wee had to do the math when he set up his TEXACO gas and auto repair station in West Scranton back in the 1940s, and just like someone who decides to sell electric charging to electric car owners will need to do today. There were 100,000 horses in New York City in 1894. I've made some calculations of how much land it would have taken to grow enough oats to feed those horses two quarts of oats each day, seven days a week, 52 weeks per year (the horse had to eat even when it wasn't working). It comes to around 10,000 acres (about two-thirds the size of Manhattan) since an acre produces 175 bushels of oats and a bushel contains 37 quarts. The rough cost to grow the oats in 1894 dollars was $4.50 per acre (that would be worth $145.88 today) or less than a penny a bushel. Let's say with the cost of getting the oats to the city and adding a bit of profit for the farmer and the feed store owner, the horse owner paid a penny a bushel. That added up to 728 cents/year (2 bushels/day x 7 days/week x 52 weeks) or $7.28 per year. A draft horse back then cost around $150.

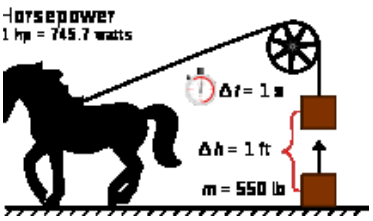
I would like you to hold a thought as you proceed through the rest of this article: The ratio of the cost to 'fuel' a horse for a year ($7.28) and the cost of the machine being fueled (i.e., the horse, $150) is 0.0485.

For sustained activity, a work rate of about 1 hp (0.75 kW) per horse is consistent with findings from both the 19th and 20th centuries.[1] When considering human-powered equipment, a healthy human can produce about 1.2 hp (0.89 kW) briefly, and sustain about 0.1 hp (0.075 kW) indefinitely. One horse does the work of ten men. Trained athletes can manage up to about 2.5 hp (1.9 kW) briefly and 0.35 hp (0.26 kW) for a period of several hours.

Steam engines needed water and coal (or coke or wood)

Coal built the railroads and the steam locomotives moved the coal.[2] If railroads depended on burning wood, as they did initially, they wouldn't have gotten very far before all the woods in the vicinity had been cleared of their trees. In the finest example of vertical and horizontal integration (see the lead article in the February issue of The Dispatcher), the coal barons were also the railroad barons as well as the real estate and retail barons.

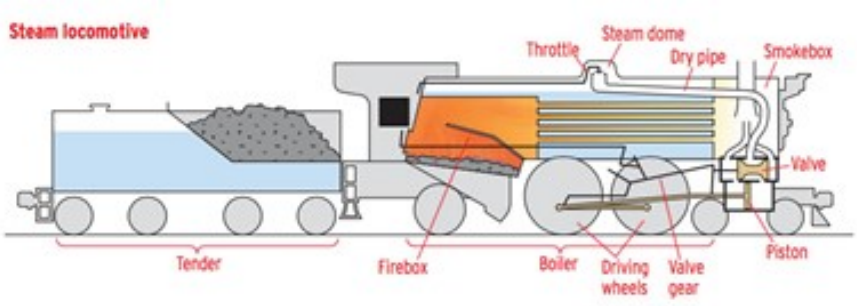
The operation of coal-driven steam locomotives is relatively simple. Coal is fed into the firebox



*One mechanical horsepower lifts 550 pounds (250 kg) by 1 foot high in 1 second. It is a unit of power with the symbol **hp.***

1. Stevenson, R. D.; Wassersug, R. J. (1993). "Horsepower from a horse". Nature. 364 (6434): 195. Bibcode:1993Natur.364..195S. doi:10.1038/364195a0. PMID 8321316. S2CID 23314938.

2. In 1952, the Norfolk & Western Railroad hauled 46,495,667 tons of coal, which represented 72.5% of the company's total freight tonnage for the year.



from the tender, shoveled by the fireman or fed in by a screw mechanism. The resulting hot gas from the coal fire enters boiler tubes, known as flues, in the main part of the boiler which is filled with water that is also carried in the tender. The water in the boiler boils, making steam. The steam rises to the top of the boiler and is collected in the dome, where the throttle regulating the flow of steam to the cylinders is located. From the dome, a dry pipe carries the steam to a superheater and then to the cylinders. The steam enters the valve chests, one on each side of the engine, which regulates the release of steam to push the pistons. The pistons drive the driving wheels. Besides coal and water, sand it also carried in the tender to spread on the track rails when additional friction is needed.

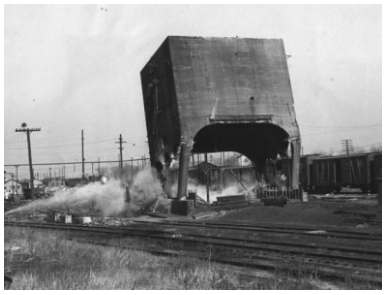
Coal was loaded into the tenders from coaling towers, like the one shown in the photo to the right. It was brought there in special coal cars called coal hoppers. The loaded hopper cars were unloaded with a pulley/belt driven system that would pick up the coal and load the tower. Tenders were gravity fed with an operator controlling the feeding of the tender. The hoppers were filled at a coal breaker, a processing plant situated at the head of a coal mine where the large blocks of coal removed from the mine were broken into various useful sizes and where impurities, such as slate, were removed. The impurities were deposited into a culm dump.[3] As the locomotives grew in size, so did their need for more coal, so the coaling towers grew in size as well.

An average steam locomotive burned 40 pounds of coal per mile. At 60 miles per hour, that was 2,400 pounds per hour. Taking an eight-hour day, 250 days per year, a locomotive burned 4.8 million pounds or 2,400 U.S. tons per year. The cost of a ton of coal in 1949 varied between $33.80 for bituminous and $60.00 for anthracite. At $50 per ton, the cost of fueling an average steam locomotive was $120,000 per year. An average cost for a locomotive in 1949 was around $265,000. That would give a ratio of fueling cost to machine cost of 0.45. The horsepower of a steam locomotive was between 4,000 and 18,000. If we take 10,000 HP, the comparison to a single horse would be $120,000/10,000 over $265,000/10,000, or **$12/$26.5 = 0.4528**. In other words, for the same cost of oats, the locomotive would be less than one/tenth of the cost **($6/$13.25)**. Little wonder that the coal-fired steam locomotive took over the job from horses and wagons of moving goods and people by the end of the 19th century.

Chicago & North Western steam locomotives are over the ash pit at the 40th Street Yard in Chicago as the coaling tower looms above them during December of 1942.
Jack Delano photo.

This coal breaker in Forest City, PA was one of many in the vicinity of Scranton, the center of the anthracite coal mining region.

3. Culm dumps had the nasty habit of spontaneously combusting from the bottom up due to the pressure of the culm. These dumps would release sulfurous fumes. In the worst cases, the fires would burn down to coal seams below ground.



In a final indignity to the age and romance of steam, the MISSOURI PACIFIC blows up its last coaling tower in the St. Louis area in December 1955, eight months after retiring its last steam locomotives.

Converting from coal to diesel fuel changed the entire economic model of railroads. The railroad barons didn't own the oil fields. Fueling a diesel locomotive wasn't the same as filling up the car at a gas station, but it was closer to that than filling a hopper with coal that came from a mine you owned along a rail right-of-way that you owned in coal hoppers that were yours.

The business of pumping gas has evolved over the years

"S.F. (Sylvanus Freelove) Bowser sold his newly invented kerosene pump to the owner of a grocery store in Fort Wayne, Indiana, on September 5, 1885. With the pump's popular success at Jake Gumper's grocery store, Bowser formed the S.F. Bowser & Company and patented his invention in late October 1887. Less than two decades later, the first purposely built drive-in gasoline service station opened in Pittsburgh, Pennsylvania with a Bowser pump. Despite the competition, in the early 1900s – as the automobile's popularity grew – Bowser's company became hugely successful. His grocery store pump consisted of a square metal tank with a wooden cabinet equipped with a suction pump operated by hand-stroked lever action. Beginning in 1905, Bowser added a hose attachment for dispensing gasoline directly into the automobile fuel tank. The S. F. Bowser "Self-Measuring Gasoline Storage Pump" became known to motorists as a "filling station" as more design innovations followed."[4]

It seems like we have come full circle on filling up our cars with petroleum-based fuel. It started with a pump out in front of a general store. Then we had the TEXACO, ESSO, GULF, SHELL, *et al*. service station franchises comprising a facility with at least two pumps, high test and regular, free maps from RAND MCNALLY or GOUSHA, a tow truck to pick you if you got stuck, and mechanics to do anything from changing the oil and spark plugs to replacing the motor. You did not pump your own gas. An attendant asked you how much you wanted and washed your windshield and checked your oil while you waited. In the 60s, the service bays were replaced with a convenience store, and gradually the pumps were sitting there on their own with a credit card reader.

Throughout the years, two things have never changed for petroleum-based fuels: 1) the raw oil is pulled out of the ground, refined into fuel which is then loaded into trucks that travel to a filling station and deposit their load of fuel into underground tanks that are connected to pumps; and, 2) people drive their cars to the filling stations and the fuel is pumped into fuel tanks in the vehicle.[5] The person or company that owns or leases the pumps and underground storage tanks pays the supplier of the fuel, and the customer fueling his vehicle pays the pump owner for the fuel by the liter or the gallon. Besides the setting for the pumping, the two

4. S.F. Bowser's "Self-Measuring Gasoline Storage Pumps" became known as "filling stations." An upper clamshell closed for security when unattended. (https://aoghs.org/transportation/first-gas-pump-and-service-stations/)

Above, Diamond Filling Station of 1920 in Washington, D.C. Below a typical 1950-1960 Texaco service station.

5. Some businesses owned their own fuel tanks and pumps. Many farmers invested in the tanks and pumps so they could fill up their various machines without having to drive them to the closest service station.

other changes are how much the fuel costs and how much fuel is needed. When I first started filling the tank in my first car in 1967, gasoline cost $0.25/gallon. Today, the price of a gallon of gas depends on which country you live in and how much influence the environmental lobby has in that country. A gallon of regular gasoline cost $7.98 today in Sweden, a country which is single-handedly going to save the human race from global warming. According to AAA, the U.S. national average for a gallon of regular gasoline was $3.41 on the 3rd of February 2022. The difference between Sweden and the U.S. is the amount of tax charged by the government. Part of that tax is being used by the Swedish government to pay buyers of BEVs a $7,000 bonus and to make up for the lost road tax from which the BEVs are exempted.[6]

Concerning fuel economy, my '61 *VW Beetle* got around 26 miles/gallon (mpg), which is about what my *2014 Toyota RAV4* gets, but my father's *1960 Dodge Dart* got around 15 mpg. Average mileage today is closer to 30-35 mpg. Horsepower is also a big variable. My *RAV4* has 176HP; Dad's *Dart* was up at 280.

What's a car's average ratio of fuel cost to machine cost? I'll use my gasoline-driven *RAV4*. It cost around $27,000 when I bought it new in 2014. If I could buy a gasoline *RAV4* today in Sweden, which I cannot, it would cost about the same.[7] I drive 15,000 miles (24,000 kilometers). The price of a gallon of gas in Sweden is outrageous, so I will use the fuel price in the U.S. to compare with the other modes. It is $3.41/gallon. Using 26 miles/gallon, my annual cost of fuel is $1,967. That gives a gross ratio of 0.0728. Figuring in the horsepower, I get **$11.7/$153.4**. It cost about $4 more per year to feed one horse of my *RAV4* than it cost to feed a horse with hay—and this is in 2022 dollars. The price of a gallon of gasoline is at record heights, but so is the price of electricity. Oats would cost more during these times as well.

Bottom line: You can't go into the fuel pumping business unless you secure a supply of fuel from a company that refines it, and what you charge for the fuel will be regulated by the governments that have jurisdiction over where your fuel storage and pumps are located. However, the basic business model and the economics of pumping gas is very close to filling burlap bags with oats, and the infrastructure of both oats and petroleum are similar to that of delivering coal to a steam engine.

6. This is one of the finest example of reversing Marx's maxim of "From each according to his abilities, to each according to his needs."

7. My wife is in the market for replacing her 2006 Toyota Corolla Verso, so we visited the Toyota dealer in town. I asked what a 2022 RAV4 gasoline car would cost. The salesman said, "We don't sell any gasoline or diesel cars, just hybrids, plug-in hybrids and BEVs. It's not because Toyota doesn't make them; it's because no one would buy them because of the cost penalties placed on them by the government. Annual road tax for a hybrid is $400 for the first four years, but for a BEV it is zero for the first four years and then go to some level that is not yet set. For a gasoline car it would be $1,300 per year for the first four years and then drop to $400.

Pumping electricity: all you need is a plug

Thinking about what it takes to get into the electric car charging business, I am reminded of the few autumn months my wife and I spent in a bedsitter when we first moved to London in September 1973. A bedsitter is a room without kitchen or bath or toilet. In our case, the bath and toilet, two separate rooms, were one-half flight up and shared with other tenants. The kitchen, a refitted glass-covered greenhouse, was one-half flight down and ours alone. None of these rooms was heated. There was no running hot water. To have a bath, you shoved a shilling (around 11 U.S. cents at the time) into a box on the wall, turned on the cold water leading into the box, turned on and lit with a match the gas that would now heat the water flowing above the flame. The cold water started flowing over a gas-fueled flame. It took a couple of shillings for a real bath. It took a couple of months of freezing before my wife said: "We're moving!"

The gas and the water were in the building. Installing the water heater was a one-time cost for the landlord.[8] He had the key to the box where he could regulate how much gas you got for your shilling, and he paid for the gas that was used to the NORTH THAMES GAS BOARD, one of the public gas companies that was formed when gas production was nationalized in 1949.

8. Colonel Burgess and his wife lived in a very luxurious flat in Knightsbridge, just around the corner from Harrods. They owned several fine buildings in Pimlico which they broke up into as many flats as were allowed by the authorities. Perhaps more.

Anyone and their grandmother could go into the bathwater heating business, and the same is true of entering the electric car battery charging business. There is actually an advertisement on Swedish TV for an electricity company showing an elderly woman dressed up like a gasoline service station attendant in the '50s plugging a BEV into a charging box on the side of her home. You can set a car battery charging box at home and pay the same rate as you pay for all your electric appliances. An apartment building owner or condo association can set up stations and charge extra for the parking space, or put a credit card reader on the box.

The big difference between this method of 'fueling' a machine versus using oats, coal and gasoline or diesel is that the electric fuel is sitting there waiting to be used. All the delivery and processing of energy happens totally in the background, and it is the same for all uses of electricity. Today, electricity is relatively ubiquitous in those places where people live, even though it may not be available where some people drive their cars and trucks, like into the woods or across deserts. There is also no difference

between charging your car and charging your computer or your phone—unless you are in a hurry to go somewhere.

So what's the story with range anxiety?

If electricity is everywhere, why are we hearing that the big problem for electric cars is that there are not enough charging stations? The simple answer is that plugging a BEV or PHEV into a 120 Volt outlet, which is the standard voltage in the U.S., is not a terribly satisfying experience. It adds 3-5 miles of range per hour of charging. The standard voltage in Europe is 230 Volts, so there is no Level 1 in Europe. If you are serious about using your battery electric vehicle in the U.S., you install a Level 2 charging station at your home or a location where you can secure the station. A Level 2 home charging station costs between $350 and $900. Installation and labor adds $400 to $1,700. A Tesla charger installation costs $1,000 to $1,700, including the Tesla Wall Connector at $500. Installing a Level 2 electric car charging station out in the wild costs between $750 and $2,600 for the charger and labor. A Level 2 charging station will fill an EV's battery 4 to 6 times faster than a standard electrical wall outlet, or about 20 miles per hour of charging. An overnight charge of 12 hours delivers 240 miles of range, still less than one-half of the range of a gasoline-powered RAV4.

The home charger has to figure into the annual costs. It is a cost that the petroleum-based car-owners do not have. Let's split the difference between the high and low costs and call it $1,675. Spreading that out over four years means that $418.75 per year needs to be added to the price of the electricity used in charging. The average electricity rate in the U.S. in February 2022 was 14.12 cents (**$0.1412**) per kWh. The average number of kilowatt hours used by an electric vehicle is **0.43kWh/mile**.[9] For 15,000 miles of driving, the result is **6,450 kWh**. Charging cost per year is then $910. Adding the $418.75 for the box results in **$1,329.49 per year**. A *Toyota bZ4X* fully electric version of my *RAV4* is going to set the buyer back around $50,000 when all the extras are counted in. That gives me $1,329.49/$50,000 or 0.0265. Bringing it down to a single horse, the ratio is **$6.18/$232.55**. For around the same price for a year of oats, I need to pay 55% more for my electric wagon. This is if I feed my horse at home and let him eat his oats through the night.

It doesn't look good for electric pumping stations

Levels 1 and 2 are not going to be acceptable in the long run for anyone who wants to use a vehicle that has a range of over 100

Electric Vehicle Charging

There are three Levels of EV charging stations. They are:

Level 1 (120 Volt AC 12/15A)

Level 2 (240 Volt AC 80A)

Level 3

- *DCFC charging (public charging)*
- *Superchargers (TESLA superchargers)*

As you move up the levels, the charging time is reduced.

Level 2 EVduty-40 EVC30 Smart Home EV Charging Station

Regular price Sale price $899.00

9. The EPA says it uses 43 kWh of electricity for every 100 miles traveled.

Level 3 Public Chargers DCFC or DC Fast Chargers.

miles and needs to travel more than that distance during the day—unless they can leave it for a couple of days and nights to charge it up. A *Level 3 Direct Current Fast Charge* (*DCFC*) charging station costs around $50,000 and can charge a vehicle in an hour with 480-volt direct current. Some of the newest EV models offer 400-volt and 800-volt charging architecture, which may allow a high-power battery to replenish from 10-80% in under 20 minutes. Even if you have that kind of money to install a Level 3 charger at your home, electric utility companies don't usually authorize them because the electric power grid in residential neighborhoods don't support it.[10]

If you want to top your car up for a trip to the mountains without having to stop for a long lunch along the way, you are going to have to take your electric wagon to a charging station, and then you are going to have to pay what the charging station owner charges. Here is what one source says: *"On average, it costs between $0.30- $0.60 kWh to charge an electric vehicle. Therefore, this means that a small car could cost about $11.50 to $23 to fully charge while a bigger or long-distance vehicle could cost between $22.50 and $45."*[11] That's two-to-four times the home charging cost. I'm not sure about you, but I would try to avoid using a commercial charging station and paying that sort of premium unless I absolutely had to.

Commercial electric charging operators are competing with every BEV car owner who has installed his own charging station, as well as competing with other commercial operators, retail stores that offer free charging while you shop, car OEMs that reward customers for buying one of their electric cars,[12] and public authorities that are trying to get their citizens to switch to BEVs so they can shine their green stars. The individual is paying residential rates, and he can also set up his own solar panels with a battery connected and pay zero for electricity (again, if he doesn't have to get anywhere in a hurry). This all goes a long way to explaining why those charging stations along highways are mostly empty.

10. The U.S. Department of Energy estimates that 80% of EV charging happens at home.

11. https://www.mach1services.com/costs-of-using-car-charging-stations/

12. Owners of the new *Audi E-Tron GT* get three years of totally free charging on the ELECTRIFY AMERICA charging network. Owners of the *Bolt EV* and *Bolt EUV* are offered $500 of free charging via EVGO. The new *Lucid Air* will come with three years of free charging at ELECTRIFY AMERICA stations.

It's not just a matter of setting up a charging point. There also needs to be someplace safe where a person can spend the twenty minutes-to-an hour in the middle of the night, which is why the charging stations are being located close to 24-hour fast food joints and convenience stores with places to have a coffee and a donut—sorry, a cappuccino and a croissant. In a few more years, when there are more BEVs on the roads, the commercial charging stations may start to fill up, but unless the commercial operators can find a way to lower prices to customers, or the OEMs can get the costs of their electric wagons down out of the clouds, it's going to be tough going for my Dad's friend Pee Wee's great grandchildren if they want to keep the family in the business of fueling cars.

Copying the fuel pump for electric charging is a poor idea

I, for one, would not invest a penny, a pence, or even an *öre* in charging stations or charging equipment. Earning money by putting a 200-400% premium on a product that anyone has access to does not have a future. A 2021 *BLOOMBERG* report sums it up well: Electric car-charging business is doing everything but making money.[13] *"A decade into its existence, the industry is still hunting for a winning business model. Two of the more established names, BLINK CHARGING CO. and BEAM GLOBAL, made less than $10 million in revenue last year. That didn't stop investors from sending Blink shares up more than 500% after Biden's November win, and while it has come well off its peak the company's market valuation is still north of $1.6 billion. Beam jumped more than 300%, though it has lost about half its value this year."*

CHARGEPOINT has figured this out. It sells stations and provides operational support, but doesn't get paid from the charging itself. It is business-to-business, selling to a company that offers its employees free charging at work as a perk. If stations sit idle, CHARGEPOINT still gets paid. *"I wouldn't want a driver as a customer, because I think I'd starve to death,"* said Pasquale Romano, CHARGEPOINT's chief executive officer, in an interview. *"There's not a lot of money in electricity."*

Someone is going to come up with a better way of putting the electric equivalent of oats into battery electric vehicles so that customers don't feel they are being gouged in an hour of need and business people can make a fair return on delivering a product and service. That's where the smart money should be going.

Electric Charge Watchdog?

A story appeared in Automotive News Europe with the title "Car industry calls for electric charge watchdog". At first, I thought it might be a hoax, but no, it's legit. The UK SOCIETY OF MOTOR MANUFACTURERS AND TRADERS (SMMT) wants the government to set up an 'Office of Charging', or 'Ofcharge' for short. Its purpose would be to "monitor the market" to ensure that enough chargers were being placed in public places, and there is an even placement around the entire country. I wonder if the same organization, which has been around since 1902, lobbied for parking meters.

13. https://www.bloomberg.com/news/articles/2021-04-30/ev-charging-industry-is-doing-everything-except-showing-a-profit

Another vexing issue is the nature of using parking spots to double as charging locations. If a customer pulls into a space in his apartment complex at 9 p.m. and hooks up to buy a few dollars' worth of electricity, more often than not, he'll leave his car there until going to work the next day. No one else can use that charger for the next 10 hours, regardless of when his car is done charging. (Bloomberg)

Sony Corp Wants to Join the Crowd of Car OEMs

Two years after the debut of the Vision-S 01 sedan concept, Sony used CES 2022 to unveil its follow-up Vision-S 02.

Sony's History

In 1946, TOKYO TSUSHIN KOGYO K.K. (Tokyo Telecommunications Engineering Corporation) started as a small company with capital of just 190,000 yen and approximately 20 employees.

Founder Masaru Ibuka said the purpose of setting up the company was to "establish an ideal factory that stresses a spirit of freedom and open mindedness that will, through technology, contribute to Japanese culture."

Symbolizing Sony's spirit of challenge to "do what has never been done before," the company has continued to release countless "Japan's first" and "world's first" products.

In 1958, the name was changed to SONY CORPORATION, and in 2021, the name was changed to SONY GROUP CORPORATION.

Wannabe success depends on the details

SONY'S CAR ANNOUNCEMENT on the 5th of January at *CES 2022* wasn't a surprise. Two years previously, at the same event, SONY introduced its first *Vision-S* concept car, a sedan. We were beginning to wonder if SONY was really serious about putting its hat into the automobile OEM ring, but now we have our answer with the *Vision-S 02*, a 7-seater crossover. Its first concept car (shown right) has now been given the official name of *Vision-S 01*.

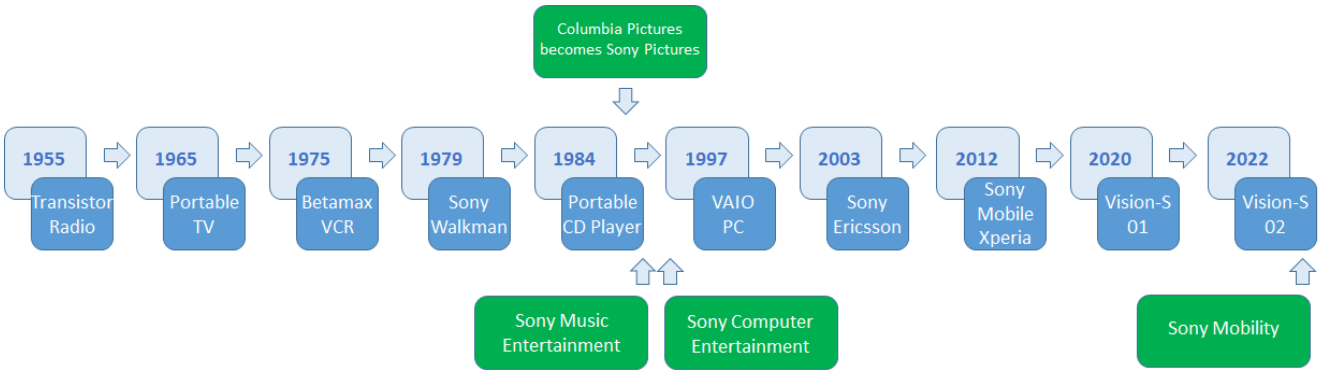
While best known for consumer electronics devices like the *Sony PlayStation* game console, SONY soon will most probably start offering electric vehicles as well, or so suggested the company's top executive during a presentation at the *CES 2022*. President and CEO Kenichiro Yoshida confirmed that SONY is setting up its own mobility unit and used the *Vision-S 02* to demonstrate its commitment and seriousness. "The excitement we received after we showed off the (original) Vision-S," said Yoshida, "really encouraged us to further consider how we can bring creativity and technology to change the experience of moving from one place to another." He said further that "SONY is well-positioned as a creative entertainment company to redefine mobility". He mentioned its imaging and sensing, cloud, 5G and entertainment technologies combined with its contents mastery as a creative entertainment company as being the key ingredients in its quest for success in the automotive sector.

Skeptics might be forgiven for having their doubts if they think only in terms of consumer electronics. SONY has gone from a totally dominant position in the days of the *Walkman* to one among many of its South Korean and Chinese rivals, not to mention APPLE. However, SONY's sensors for advanced driver assistance systems incorporated into most of the world's smartphones and digital cameras are an important and growing part of its imaging business. It is also a major force in both music and film. *SONY MUSIC ENTERTAINMENT*, also known as just *SONY MUSIC*, is an American

multinational music company that is owned by the parent conglomerate SONY GROUP CORPORATION. It was established in 1991 and traces its roots back to AMERICAN RECORD CORPORATION (1929–1938), COLUMBIA RECORDS, USA (1938–1957), and EPIC RECORDS (1948–1991). *SONY PICTURES* is among the top six global movie producers.

Sony has invented products and reinvented itself

The company has an impressive history of creating products that have been technological wonders and commercial successes, both in the consumer and business marketplaces. One area in which they have struggled is smartphones. They bought out ERICSSON's share in SONY ERICSSON in 2010, but their *Xperia* share of the market fell from 14.6 million in 2016 to 2.9 million in 2020. SONY also lost the VCR war that started between them and their Betamax format and JVC's VHS. VHS eventually won the war, principally due to its more open format. Maybe SONY tried to apply this lesson learned in its choice to adopt the Android operating system for its phone at a time when NOKIA and BLACKBERRY reined with their own proprietary ecosystems, but it did not help against SAMSUNG and then APPLE. Its *Vaio* laptops are outstanding. We have one in our household, so I can vouch for its quality. But they are not big sellers.



SONY's products are acknowledged to be of very good quality, although they are also more expensive than competitive products of similar quality. It seems to have taken the approach of many of its Japanese business colleagues, to enter multiple business areas to protect itself against a collapse in one, particular market. The problem with this approach is that some of its divisions may get starved for investment which they need to achieve better performance and lower prices. Is *SONY MOBILITY* just another sideline?

Two cars and a promise of a plan

SONY CEO Yoshida was light on the details of the promised *SONY MOBILITY INC*. It will be officially formed this spring, and it will not be limited to just electric cars. At the press conference, Yoshida

said that SONY is well positioned to redefine mobility. It is only speculation at this point, but this could mean anything from developing two-wheeled solutions to putting *PlayStation* into school bus seats. At this point, it is the new mobility organization that has been given the conductor's baton. However, even the most brilliant conductor needs an orchestra, and all the members of the orchestra must be talented musicians if the performance will receive hearty BRAVOs!, rather than polite applause or, as was the case in former times, raucous BOOs. There does not have to be a Yo-yo Ma among the cellists, or a Ginger Baker among the percussionists, but every single one of the musicians needs to be able to carry their weight.

What's even most important is that you don't leave out the strings and the brass completely, and that is exactly what most of the wannabes have been and are doing.[14]

What will make or break all the wannabes

As we have been seeing for the past several years, it is relatively easy to get from a sketch on the back of an envelope to a moving vehicle (although NIKOLA had to do some faking to show its first semitrailer).[15] Choosing to work with an experienced contract automobile manufacturer like MAGNA and tier one suppliers like BOSCH and VALEO is certainly a smoother path to market than trying to build everything from scratch, as TESLA did. But where all these newly minted car companies, including TESLA, stumble is in the car company basics. Yes, they can build a car that is roadworthy, especially if they either license technology from an existing car maker or hire a company like MAGNA to build their car. Yes, they can dazzle the senses with driver-to-passenger window digital screens (see SONY's interior in the sidebar), and deliver an infotainment experience that makes the CES crowd cheer.

These tricks do not make them car companies, and the pieces that they all miss are exactly the things that the 'legacy' car companies missed when they left their home markets to sell abroad (see ***Why I never bought another Ford*** on next page), when they decided to put mobile communications and eventually Internet in their cars, and when they moved from a one-year warranty for the parts that drive the vehicle to multi-year warranties and breakdown services. The legacy companies could afford to make mistakes in a test market because they had a solid base of sales in their home markets. And they all made mistakes. The wannabes all have expectant shareholders who want to see sales shoot up from the

14. Among the wannabes I count RIVIAN, NIKOLA, SERES, LORDSTOWN, XPENG, AIWAYS, HONGQI, MAXUS, ORA, NIO. If APPLE and SONY decide to enter the field, they would also be on my list.

15. Nikola misled investors when it showed a video of a truck travelling along a highway, but the truck was not powered by an actual motor and was simply gliding downhill.

An interior view of the Vision-S 02 with its front seat instrument display panel spanning the entire width of the car.

16. Not a single person involved in the founding, funding or initial management of TESLA had ever worked for a car company or built a car. Higgins says that Martin Eberhard, one of the two company founders, "flat out rejected the notion that experienced automotive industry executives from Detroit might be helpful" in running the fledgling company when it was started in 2003.

Higgins, Tim. Power Play: Elon Musk, Tesla and the Bet of the Century. See Musings of a Dispatcher in October 2019 *THE DISPATCHER*.

day the cars launch. I have not seen any signs that these new companies wish to learn from those who went before. TESLA seems to be the model, and its management made it a point to never take a lesson from anyone.[16]

Here are the make or break points

If you are thinking of buying one of the new cars announced by one of the growing number of 'I-want-to-be-a-car-company-too' companies, or investing in one of them, here are a few things you should discuss with company representatives. Ask them whether these points have been addressed—before you plunk down your money either to buy one of their models or invest in the company.

Telecommunications

It's just a mobile phone in the car, right? I have heard this from both OEM staff who are integrating communications into their cars for the first time, as well as from the mobile phone companies who are also new to the game. It's not just a mobile phone in the car. It's an interface, mostly for data, between the in-vehicle systems and the out-of-vehicle services. The interface device in the vehicle has been given many names. I call it a telematics control unit (TCU), and it's the SIM-chip in the TCU which is required from the mobile network operator that is its principal component. There are those who have turned over the entire selection and integration process of the SIM-card to companies that purport to be experts in the integration and management of SIM-chips and their management. That is a very bad idea, because those SIM-chips will be in the cars long after these companies have either disappeared or changed their business models.

Testing

We can do all our testing around the factory. Why do we need to test again in the country where we are selling? The only types of tests you can perform around the factory are whether the brakes work and the car can get through a slalom course without rolling over. That's an exaggeration, but given that so much of what needs to be tested is dependent on communications, it makes no sense to test a car that will be sold in Boston in a parking lot in Beijing.

Multi-country organization and local contracts

We're going to sell on the Internet and all our dealings with our customers will be over the Internet. Why do we need to have representation in the countries or the states where we are selling our cars? Around the time these companies are beginning to put their

Why I never bought another Ford

My very first new car came in 1970, after the '63 Beetle. It was also white, an English Ford Cortina station wagon. It was my first and (to-date) last Ford, my first and (also to-date) last English-made car. The Cortina was a great car for the first year, it was a nightmare for the second, it was on blocks for the third while I was living and working in London, and when I returned and drove it up to Cambridge in 1973—its second-to-last trip under my direction—it became someone else's problem. I sold it to an MIT undergrad. In the Cortina's second year, after the one-year warranty expired, it developed a strange habit of suddenly losing all electrical power and simply stopping dead in its tracks. I would drive it at night and the lights would begin to dim. I would turn off the lights and drive it blind until I got home. I took it to the Ford dealer in Princeton where I bought it. Ford told me they didn't have the metric tools to fix these 'foreign' cars, and suggested I take it to the foreign car garage in town. I did, and got an estimate for just looking at the car that was more than I paid for it. No mechanic could find the problem. It was most likely an electrical short. I didn't miss the excitement of owning the Cortina during the year I lived in London. I don't think I even thought about it until I saw it in the barn in New Jersey where it had been hibernating for a year.

It made it all the way up to Cambridge after I revived it. That was in October, 1973. The MIT student needed two separate test drives to make up his mind. It started, miraculously, both times. I drove it to within a block of his apartment on the morning the deal was to be finalized and parked it for the day. It started again. That was the last trip in the Cortina and in a Ford that I owned, and last time I sold my own car.

ad campaigns together, a lawyer they have finally hired to review the legal details informs them that they are not selling sneakers.[17] Unlike with sneakers, customers prefer to have a test drive, and you can't order three of them and send back two for free.[18]

Factory-to-Customer delivery processes

Customers can pick up their cars at the local mall, can't they? Legacy companies have dealers, and dealers have all the facilities and legal approvals to prepare a car for delivery, to take it out of transport mode, load final versions of software that have been updated during the months the car has been in transit and sitting in storage lots, and to obtain the registration plates (temporary or permanent) on behalf of the owner. If a wannabe is planning to do all of this with a couple of youngsters, it will soon find that all that fancy infotainment software is confusing the hell out of both its employees and its customers.

Warranty processes

If we give our customers a long warranty period, they will be more likely to buy our cars? A warranty means that you are on the line, both legally and financially, to fix something that breaks. There are laws in different countries, or even states within countries, that regulate what you need to fix within certain time limits.

Breakdown assistance end-to-end processes

Electric cars don't break down, so why do we need breakdown assistance? Electric cars break down just as much as non-electric cars, so stop kidding yourselves.[19] But, according to the American Automobile Association, the main reasons people need roadside assistance is because they have lost their keys, they have flat tire or a blowout, and they have a dead battery. Legacy companies have coupled their warranty periods with various types of benefits that can be obtained in case a problem occurs when a customer is far away from home or is inconvenienced as a result of a breakdown. This could include a free night at a hotel, a replacement vehicle, a plane ticket, train or taxi ride home, and repatriation of the vehicle.

Service and Repair network

Electric cars don't need service, so why do we need to have agreements with a repair network? Electric cars need service, so stop kidding yourselves. At a minimum, the cabin air filter needs replacement, tires need to be rotated (and changed each winter and spring if you live in a place where it snows), brake fluids need to be replaced, brakes need to be checked, brake calipers need to be

17. Most consumers are not looking to buy their next vehicle online; interest in a fully online purchase process is limited to one in four consumers or fewer in other markets around the world. (Deloitte) The purchase journey itself is happening online, but the purchase often still happens offline. https://www.findthebest-carprice.com/car-buying-statistics-trends/

61.4% of car buyers prefer to buy from a dealership (TheZebra)

Dealerships are consumers' largest source of financing for both new and used vehicles. (CoxAuto)

18. According to a study by McKinsey & Company, more than 80% of buyers take test drives, and they do this at dealers.

19. https://news4sanantonio.com/news/local/aaa-370000-people-anticipated-to-need-roadside-rescue-during-thanksgiving-travel

cleaned and lubricated, air conditioning requires regular service, lights burn out and need replacement, wiper blades break, window controls break, windscreens need to be replaced….the list continues. When repairs are needed, there needs to be a place where they can be performed. If they happen under warranty, there needs to be an authorized workshop that performs them because they will be free to the customers. TESLA has set up its own workshops, even though they are few and far between. Some wannabes try to make agreements with repair networks, like BOSCH, or by partnering with car companies. There is little in it for legacy OEMs to support a competitor.

Recall processes

We'll fix everything over the air, won't we? (See *Telecommunications* above.) Is the closest place you can obtain a recall repair in the next country, next country or somewhere within a half-hour drive? This matters. Everything cannot be fixed over-the-air.

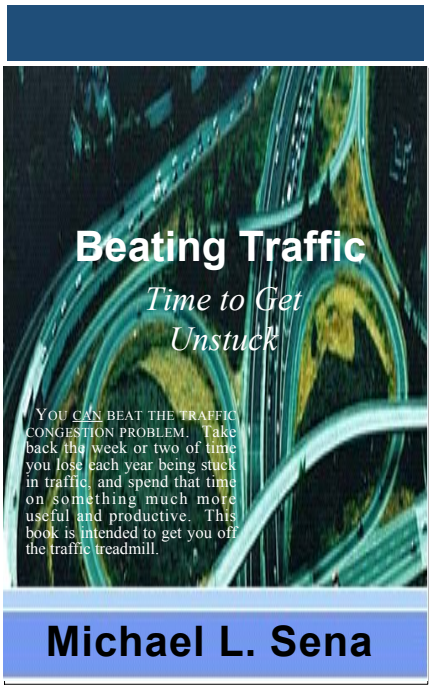
Trade-ins

Customers can sell their own cars online, can't they? (See *Why I never bought another Ford* on page 14, sidebar.) A dealer won't call you at one a.m. to ask you why the car you sold him won't start.

Summing up

Did I buy a *Walkman* when they were first introduced and I was jogging from my apartment on Shepard Street in Cambridge to Fresh Pond and back again? No I didn't. I wanted to be alert to the traffic sounds on the streets, and to hear my other thoughts blended with bird song when I was on the path around the pond. But if I remember correctly, I was in the minority. Would I buy a *Sony Vision* car if it was produced by a real car manufacturer like MAGNA? Maybe, but it would take a lot to convince me to buy a car that was produced by a company like FOXCONN. However, I would **definitely not** purchase one of SONY's, APPLE's or any of the wannabe's cars before more than a few years had passed and I could be certain that it did what a good car company should do in every one of the areas I have listed above. It must prove that its car had been thoroughly tested in the market where I would be driving it; it must prove that it could quickly, efficiently and cost-effectively fix problems with its cars; and it must prove that its cars have a trade-in value. Why on earth would anyone do otherwise?

Dispatch Central



20. Sena, Michael L. *Beating Traffic: Time to Get Unstuck*. AuthorHouse. (2007)

You can read it by going to my web site: http://www.michaellsena.com/books/

To beat traffic, give commuting a rest

"IF YOU LIVED HERE, YOU'D BE HOME NOW." These words have stuck in my memory since the first time I read them many years ago. They were printed on a sign that was posted right on Storrow Drive in Boston, Massachusetts at the edge of a high rise, high rent apartment complex. The sign stared commuters in the face every day, taunting them as they struggled with the daily grind of traffic congestion at one of the principal bottlenecks in the city's transportation system.

IN 2007, I completed the writing of a book I had worked on for about five years.[20] It was a little book of only 136 pages, but it had an ambitious goal: To get people to think about why they were stuck in traffic and to do something about it. Every now and then I take down one of the half-dozen remaining copies from the first printing run and re-read one of the chapters to see if anything I wrote 15-20 years ago makes any sense today. Do any of the ideas or recommendations in it show the slightest sign of prescience, or are they half-baked, myopic or shortsighted? My verdict: It's about half and half.

An article in *THE ECONOMIST JANUARY 15TH 2022 issue* caused me to open a copy of the book to the 'Give Commuting a Rest' chapter. That's where I wrote that one of the best ways to beat traffic was to try working from home as often as possible. It's impossible, I wrote, to create a life-long match between where you work and where you live unless you run your own business and locate it either in or near your home. Sooner or later, you may find yourself commuting, and it is work-related congestion that gives us the biggest headaches.

"Commuting is about tradeoffs, but it is not always a sure bet that living in a city, like the apartments in Boston, will guarantee you a commuting-free life, just like living in a small town or even a suburban setting means that you have to drive for hours to work every day. You may begin with good intentions, to live in a city close to your job. Then, suddenly, the city-based company that is only a short walk from your door decides to move to a rural campus. You decide to move out of the city closer to your job, then your company is acquired and your job is eliminated."

THE ECONOMIST article was in the *Finance & economics* section in the *Free exchange* column. It discussed research findings that were presented on The Future of Work by economists at their annual conference that would have been held in the middle of winter in Boston, but was once again held virtually. Since May 2020, a team of research economists have conducted a monthly survey that has asked Americans about their plans to work remotely. In January 2021, the results of their survey indicated that remote work would account for 20% of full-time hours after the pandemic.[21] By December of 2021, the percentage had risen to 28%. Before the pandemic started, only around 5% of the American workforce worked at home. This increase of 23%, which has occurred as a result of attempts by governments to minimize the spread of the virus, will persist, claim the economists. The reasons are that the experiences of remote working by both employees and management have been surprisingly positive. Also, firms have invested large amounts of time and money in improving the experience even further.[22]

21. Jose Maria Barrero, INSTITUTO TECHNOLÓGICO AUTÓNOMO DE MÉXICO; Steven Davis, UNIVERSITY OF CHICAGO; Nicholas Bloom, STANFORD UNIVERSITY

22. Mr. Barrero estimates the investments in adapting to remote work represent about 0.7% of America's GDP.

Here are a few more takeaways from the research:

- Although some workers look forward to returning to their place of work, around 15% said they would definitely or probably leave employers who do not offer remote options
- People are happier to move away from big, expensive cities to smaller places that are more affordable.
- Reductions in commuting time as a result of hybrid arrangements would produce a "doughnut effect" as people left city centers for distant suburbs.
- There are clear outflows from high-cost places like California to less costly places like Texas (where there is no State income tax).

In 2007, I did not foresee a pandemic, which has lasted for over two years at this writing, providing the opportunity for people to separate work from commuting—even if the commute was not by car. My suggestions to reduce the stress of commuting consisted of choosing different routes each day, varying the mode of travel from car to transit if the options exists, changing the time of travel, preferably leaving later than earlier, and, most important, working from home at least one day a week, even taking vacation days if your employer doesn't allow remote working. I wrote: *"This (*working from home*) may sound like the ultimate cop out, or even a call for early retirement. I would say it's more a matter of pacing yourself to be able to stay the course and finish the race, rather than crashing and burning along the way."*

All of us would surely have preferred to avoid the enormously negative effects of COVID-19, especially the huge loss of life and long-lasting health problems it has caused. Most of us have lost members of our family, friends or colleagues, so looking for a silver lining on the black COVID-19 cloud is inappropriate. Nevertheless, as with all catastrophic events, whether war, pestilence or natural disaster, there is the aftermath. One of them for COVID-19 is that between a quarter and a third of workers will not get into traffic every day. This fact should inform our thoughts on everything from promoting congestion charging schemes to how cities will keep their tax-paying citizens.

There's been an event in the world of cameras

EVENT CAMERAS are trying to grab some face time in the field of vision for robots. What are event cameras, what do they do that the other twelve types of cameras can't do—specifically in the area of vehicle vision—and when can you expect to encounter one?

Developers of event cameras, also known as dynamic vision sensors (DVS), are claiming that the response time of these devices compared to frame cameras enables faster maneuvering and obstacle avoidance by the land- and air-based vehicles that will use them. One research team working with event cameras, the *Robotics and Perception Group* at the UNIVERSITY OF ZURICH says that its team is already working with a European automotive OEM to test how event cameras can be incorporated as additional aids in their self-driving car configurations.[23] In addition to their speed, event camera data do not require compression as frame camera data do because event cameras do not capture redundant data in each frame, so they are estimated to be forty times more efficient than frame cameras after compression.

23. *THE ECONOMIST JANUARY 29TH 2022. Prometheus unframed.*

The flies have it

What are these marvels? Let's start by identifying what they are not. Not much has changed since Louis Daguerre invented the first publicly available photographic process in 1839. A shutter opens, light hits a substrate that captures the image. In the 19th century, the substrate was silver-platted copper. Today, the substrate is a light-sensitive chip. With video cameras, the shutter opens multiple times per second, and the speed of the opening is what determines the quality of the images. With *daguerreotype* images, the exposed substrate is exposed to chemicals and the image is revealed. With digital recording, the images are recorded as active (CMOS) or passive (CCD) pixels, with the quality of the

image determined by a range of factors, but with the quality of the image increasing with the amount of data.

Event cameras work like the human eye, or, to be more precise, like the eye of a fly. These cameras have no shutter. Like a CMOS camera, they have a chip (substrate) with hundreds of thousands of tiny, light-sensitive pixels. Each of the pixels records data according to a simple set of conditions, all based on the change in perceived light (which is the event): did the amount of light received go up; did it go down; did it stay the same. If either of the first two conditions are met, the pixel transmits the new value, but if the third occurs, no new data is sent. Each pixel in the event camera operates independently, and the responsiveness of the image recognition is currently around 1 millionths of a second.

A comparison of frame and event cameras was provided in *THE ECONOMIST* article referenced above. A frame camera shooting 20 images per second supplies data at 50-millisecond intervals. Event cameras can respond in microseconds. Collision-detection frame cameras mounted on driverless aerial vehicles usually take 50-200 milliseconds to react. The event camera being developed at the University of Zurich has cut this to under four milliseconds.

Changing light it most often the result of movement, and this is what event cameras record. As the images below show, a split-second recording of a scene can be reconstructed from the data received from an event camera, but this is not their main purpose. What they do best is help to determine the rate at which objects in their visual field are moving. This is known as 'optical flow'. Optical flow shows how fast the camera is moving and how close other things (cars, pedestrians, speed bumps, etc.) are to it. They have no problem with bright and dim lighting in a single image, so a pedestrian in shadow on a brightly lit street would not be missed.[24]

We will be hearing much more about event cameras in the coming months, first for driverless aerial vehicles and then for self-driving cars, trucks and R2D2-like delivery *BOT*s. It looks like it's a technology with wings.

The house fly is known for its evasive maneuvers. Flies have many adaptations that lend them heightened speed, maneuverability and perception, making them very, very good at detecting and evading even the swiftest swats. Animal brains perceive the passage of time by processing images at speeds known as the "flicker fusion rate," a term describing how many images flash into their brains per second. Roger Hardie, a professor emeritus of cellular neuroscience at the University of Cambridge in England, implanted electrodes into the photoreceptors of flies' eyes to measure their flicker fusion rate, calculating it to be 400 times per second; the average flicker fusion rate for humans is about 60, according to the BBC. This means that movement you perceive as "normal" moves like slow-motion to a fly.
https://www.livescience.com/why-flies-hard-to-swat.html

24. The tragic accident that occurred on a dark night in Tempe, Arizona involving an Uber taxi and a woman who was walking with her bicycle might not have happened if the vehicle's sensors had been able to detect her in the shadows sooner than they did.

Daimler becomes Mercedes-Benz

HOW DID THE heirs of Gottlieb Daimler take the news? Someone had to break it to them, that one day they were the kingpins and the next day they were nobodies. Well, not quite nobodies. They did get to keep their name on the truck part of the **DAIMLER AG** company that was split into two: DAIMLER TRUCK AG and MERCEDES-BENZ GROUP AG. The separate truck and bus portion was established in November 2019, but it was not officially a public company until the 10th of December 2021. Martin Daum is Chairman. MERCEDES-BENZ GROUP AG became officially registered on the 1st of February 2022. Ola Källenius is Chairman of the Board of Management of MERCEDES-BENZ GROUP AG.

Daimler Truck Brands

- Mercedes-Benz: light, medium and heavy trucks, buses
- Freightliner: medium and heavy trucks, vans
- Western Star: heavy trucks
- Thomas Built Buses: school buses
- Fuso: light and medium duty trucks
- BharatBenz: Truck brand in India
- TruckStore: used vehicles, financing, leasing, rental, warranty and service contracts, and buyback
- Setra: buses
- Fleetboard: telematics and Connectivity

Mercedes-Benz Group Brands

- Mercedes-Benz Cars
- Mercedes-Benz Vans
- Mercedes-Benz Mobility
- Others: Mercedes AMG High Performance Powertrains builds engines for Formula One racing

Why is this happening? CEO Ola Källenius has been given the charge to lead the automobile portion of the company into the higher reaches of stock market valuations. It will position itself as a nimble, BEV-based mobility provider, leaving behind all those years of diesel fumes and luxury limos. He was quoted as saying to reporters at a press conference in late January: "We have a real chance to raise the multiple. If we can boost cash flow and our multiple, there's lots of potential in the Mercedes-Benz stock."

Well, Ola, one day you may look back on those times and wish that the good old days would come back. On the 1st of November 2021, M-B's stock price over the counter in the U.S. reached $101.00, close to its all-time-high of $110.15 on the 1st of October 2007. Also on the 1st of November 2021, TESLA's shareholders were making Elon Musk the richest person on the planet by pushing up TESLA's

Herr Daimler and Herr Benz

Gottlieb Daimler had developed the first liquid petroleum vehicle in 1885 and Karl Benz had developed the first purpose built automobile using a 2 cycle engine of his own design a few months later. Daimler never met Karl Benz during the period of invention. In 1896 Daimler (DMG) sued Benz & Cie for violating his 1883 patent on hot tube ignition. Daimler won and Benz had to pay royalties to DMG. Daimler did not meet Karl Benz while they were in court in Mannheim. Later at the founding of the Central European Motor Car Association Daimler and Benz still did not speak to each other.

Years after Daimler died, the two companies did cooperate in many ways. After many years of cooperation, on 28 June 1926 representatives of Daimler-Motoren-Gesellschaft (DMG) and Benz & Cie signed the agreement for the merger of the two oldest automobile manufacturers in the world. The resulting new company was named Daimler-Benz AG.

ENCYCLOPAEDIA BRITANNICA

stock price on NASDAQ to and all-time-high of $1222.09. On Valentine's Day, the 14th of February, M-B was trading at $83.50 (down 18%) and TESLA was at $875.76 (down 30%).

RIVIAN, the darling of the electric car promoters, went public on the 10th of November 2021 and had a share price of $129.95, double GM's. On the 14th of February, RIVIAN was down 52% to $62.65. GM had dropped 14% to $48.40.

Stratospheric market caps are nice dreams to have, but dreams have a way of turning into nightmares. On the whole, I believe investors would prefer steady growth resulting from a solid match between the products the company is selling and an appreciation of those products by people who buy them. I truly hope that Ola is not the sacrificial lamb or the canary in the coal mine who will be blamed and discarded if the potential he talked about does not materialize.

Chekhov's Gag: DeLorean and de Vries in double redux

WHEN I SAW the name of the CEO of the new company that is planning to revive the *DeLorean* as an electric car, I said to myself: "I know that guy from VOLVO." Sure enough, it's the same Joost de Vries I knew in 1997 when he was Director of *VOLVO ACTION SERVICE* and I was looking for a supplier of call center services for *Volvo On Call*. He went on to other roles within *VOLVO TRUCKS*, and then, in 2005, made a dash for China to become president of a VOLVO BUS/XIAN AIRCRAFT CORP. (state-owned) JV called XI'AN SILVER BUS CORP. He moved to AB VOLVO-owned MACK in 2010 and then to TESLA in 2012, where he was VP Worldwide Service for one year and nine months. A dump truck company came after that and then his stint with KARMA, based in Irvine, CA, started in 2015. He was VP of Global Sales and Customer experience when he left to take up the role on December 2021 of CEO of DELOREAN MOTORS REIMAGINED LLC, which will be based in San Antonio, Texas.

Joost and others from KARMA, including the new company's chief marketing officer and the VP of engineering, are working with Stephen Wynne, who acquired the DELOREAN branding rights in the 1990s and has been supplying parts for the cars since then.

What about KARMA? Its web site is still operating (https://www.karmanewsroom.com/). There was talk of bankruptcy in 2020, but its Chinese owners, WANXIANG GROUP, appear to be willing to keep it going. Wanxiang purchased the assets of FISKER AUTOMOTIVE in 2014 for $149.2 million, which also included

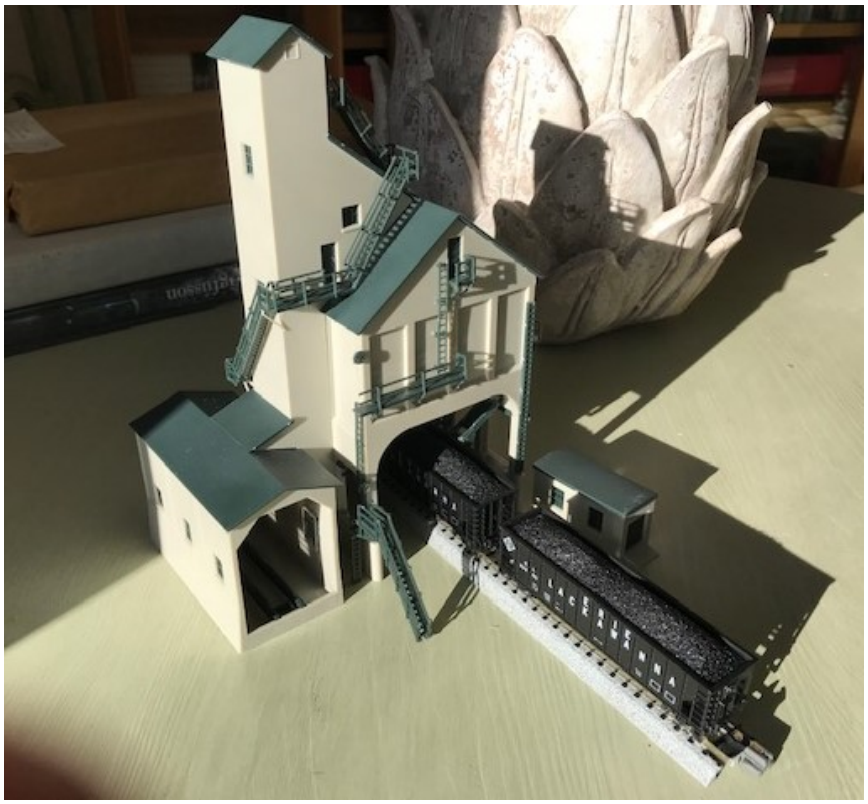
25. The term 'Chekhov's Gag' has come to mean "an insignificant object that later turns out to be important."

The DeLorean keeps returning, like the brick in the Brick Joke. The Brick Joke is named after an old joke, which seems at first blush to be a pair of unrelated jokes. At the end of the first joke, a brick is tossed away, leaving the confused listener without a punchline. At the end of the second joke, the brick returns and the listener falls on the floor laughing. For bonus points, the teller can tell an actual unrelated joke in between. Sometimes, the Brick Joke structure of introducing a seemingly irrelevant feature, only to return to it much later, after the audience has largely forgotten about it, can be used for drama as well as comedy; when that feature was a joke, it's known as Chekhov's Gag.

the Wilmington, Delaware assembly plant, which it later sold. In 2020, KARMA sued LORDSTOWN MOTORS for theft of intellectual property and poaching of employees in the development of an infotainment system that KARMA claimed originated with KARMA.

And as I was looking at information concerning the suit, I found another person from my early VOLVO days, Stefan Gudmundsson, who was chief information officer at KARMA when the suit was filed. Stefan and I worked together at *VOLVO TECHNOLOGICAL DEVELOPMENT* during two years. It appears that he is continuing in a role of strategic advisor to KARMA while he holds the position of VP Connected Product Experience at *LIVEWIRE,* an electric motorcycle company and division of HARLEY-DAVIDSON MOTOR COMPANY.

The world is indeed small. You never know when something that has been misplaced or someone who has been all but forgotten will return. Good luck, Joost. You, too, Stefan.



Model Coal Loading Tower

Eventually, this coaling tower will be part of my N-scale train layout, lifting coal out of the coal hoppers to feed into the last remaining steam engines in use. Steam engines disappeared on the DL&W and Erie main lines before the two merged to form the Erie Lackawanna Railroad in 1960. The last steam train left Hobokon Terminal in 1953. Coal switchers were still in use into the '60s.

Musings of a Dispatcher: Running on CO_2

26. **Photosynthesis** is a process used by plants and other organisms to convert light energy into chemical energy that, through cellular respiration, can later be released to fuel the organism's activities. This chemical energy is stored in carbohydrate molecules, such as sugars and starches, which are synthesized from carbon dioxide and water – hence the name 'photosynthesis', from the Greek phōs (φῶς), "light", and sunthesis (σύνθεσις), "putting together". To perform photosynthesis, plants need three things: carbon dioxide, water, and sunlight.

27. https://auto.howstuffworks.com/fuel-efficiency/alternative-fuels/car-run-carbon-dioxide.htm

28. https://en.wikipedia.org/wiki/Carbon_Sciences

29. Zehner, Ozzie. Green Illusions. Lincoln and London: Bison Books (2012)

Why not make like a tree and leave?

THIS IS A real musing, meaning that it is intended to express my own reflections and help my readers in their comptemplations. Has the answer been in front of our noses the entire time? Has it just been sitting there in plain daylight, just waiting for someone to say: "But what if…?" I think it has, and our friends, the trees, have been doing everything they could do to show how it could work. What if we could run our cars and trucks and buses and trains on thin air using photosynthesis as the engine.[26] Some people think we can.

Before we dig more deeply into this idea, let's see off the criticism that seems to always appear when alternative fuels are suggested, which is that it takes more energy, usually in the form of electricity, to make the fuel, so why not just use the electricity directly?

You do not need to look long or hard to find articles and whole books debunking every alternative to the battery electric vehicle (BEV) which everyone seems to believe is the last invention we will ever need. I found such an article from 2012 on the web site *HOWSTUFFWORKS* that asks the question: *Will cars ever run on carbon dioxide or is that marketing hype?*[27] The author, Eric Rogell, starts out by giving an example of a company, CARBON SCIENCES,[28] that is (or was) actually working on producing diesel fuel from carbon dioxide. The company claimed that it had developed a "breakthrough technology" that could take CO_2 and use it along with methane and a catalyst to create a synthetic gas in a process known as 'gas-to-liquid' or GTL. The result, it was said, could be used to create clean diesel and gasoline fuels that could be burned directly in existing diesel and gasoline engines without any need for retrofitting. Similar technology is also being developed at the SANDIA NATIONAL LABORATORIES and at a joint venture between UOP LLC and the UNIVERSITY OF SOUTHERN CALIFORNIA.

Ozzie Zehner, visiting professor at UNIVERSITY OF CALIFORNIA BERKELEY and author of the book Green Illusions,[G] says *"all this CO_2-as-a-fuel talk reminds me of the failed hydrogen dream of just a few years ago (*this is 2012 when he is writing, remember, and Toyota, Hyundai and BMW haven't

given up on it yet*). That technology used excess solar wind power (he does not explain what he means by 'excess') to create hydrogen to power cars. The only problem was in order to make that happen you needed to put more energy in to create hydrogen fuel than you got out of it. It's like having a machine that creates $20 bills, but it costs $23 to create each one".* There seems to be something about hydrogen as a vehicle propellant that attracts the most negative opinions, don't you think?

This type of criticism is based on the assumption that the motor needs something like the fuel it has been using, such as gasoline, diesel, liquid natural gas, methane, natural gas, biogas, or hydrogen which must be converted from something to a usable fuel. That is true for all of the existing vehicles, but, obviously, battery electric vehicles are not using fuels. They have special motors built to use electricity, and that electricity is fed to the special motors from batteries. The batteries are built into the vehicles to be charged with electricity that is produced with all types of fuels, including energy from the sun, wind, and water, as well as coal, nuclear, and gas. So, if it's good enough for the goose (i.e., to produce a special motor) it's good enough for the gander.

What might be a good alternative to a BEV that would have a special motor that does not depend on electricity and batteries? Why not one based on photosynthesis that converts carbon dioxide in the air to an energy source that is used directly by an engine that powers the vehicle?

Green plant power

The simple answer to the question, Can you run cars on carbon dioxide?, is No, you cannot. Carbon dioxide is the product of combustion and cannot be burned. You can compress it and run an engine like those that run on compressed air, but this has apparently not been done with CO_2. But plants don't just eat CO_2 directly. An article in *ALTERNATIVE ENERGY NEWS* started out as follows*: "If a car is running smoothly on the road and its consuming carbon dioxide from air as fuel instead of petrol, what a dream world that would be".*[30] Researchers from England's South West are working on a £1.4 million project to literally turn the above dream into a reality. Their aim is for future cars to consume (literally) one of the root (pun intended) causes of the greenhouse effect: carbon dioxide. Scientists and engineers at the UNIVERSITY OF BATH are leading the research. They are joined by colleagues at the UNIVERSITY OF THE WEST OF ENGLAND and members from the UNIVERSITY OF BRISTOL.

Trees Are Impressive

A single mature tree can absorb carbon dioxide at a rate of 48 pounds per year and release enough oxygen back into the atmosphere, 260 pounds, to support two human beings.

One acre of trees annually consumes the amount of carbon dioxide equivalent to that produced by driving an average car for 26,000 miles. That same acre of trees also produces enough oxygen for 18 people to breathe for a year."

Ents in J.R.R. Tolkien's Lord of the Rings

30. http://www.alternative-energy-news.info/car-fuel-from-carbon-dioxide/

Dr Frank Marken, Senior Lecturer in Chemistry at the UNIVERSITY OF BATH said: *"Current processes rely on using separate technology to capture and utilize the CO_2, which makes the process very inefficient. By combining the processes, the efficiency can be improved and the energy required to drive the CO_2 reduction is minimized. It will be a massive challenge but we have a strong inter-disciplinary team that includes chemists, chemical engineers, biologists, and life-cycle analysts."*

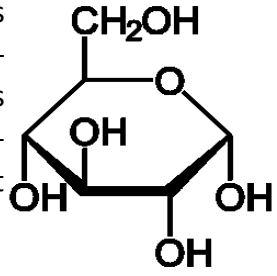
Dr. Petra Cameron, RCUK Fellow from the Department of Chemistry at the UNIVERSITY OF BATH, said: *"We hope that the use of renewable energy to recycle CO_2 will be an effective way to reduce the amount of CO_2 in the atmosphere. When this project will be completed it will mean that new kinds of fuels can be produced from old 'carbon emissions' that are generated from factories, plants and even cars themselves. The idea of 'recycling' carbon emitted from the fossil fuels, is not new. But people are warming up (*his pun, not mine*) towards this idea now. Now there is no dearth of funds for such innovative ideas."*

Dr Ioannis Ieropoulos, UNIVERSITY OF BRISTOL, said, *"One of the great advantages of this project is that it will exploit the natural abilities of microorganisms to reduce CO_2 in the atmosphere and at the same time produce electricity or hydrogen, as required."*

Dr David Fermin, UNIVERSITY OF BRISTOL, said: *"Currently, there are no large-scale technologies available for capturing and processing CO_2 from air. The facts are that CO_2 is rather diluted in the atmosphere and its chemical reactivity is very low. By combining clever material design with heterogeneous catalysis, electrocatalysis and biocatalysis, we aim at developing an effective carbon neutral technology."*[31]

Trees don't eat carbon dioxide, and neither will cars

This model of photosynthesis, in which green plants use sunlight to convert CO_2 and water into a simple form of sugar, glucose (**$C_6H_{12}O_6$**), provides a great foundation for understanding the relationship between trees and carbon dioxide. However, it is incomplete without a second model that explains what happens to all that sugar: it serves as food for the plant. This is the important part. Every living cell needs energy to survive, and for most plant and animals cells, this energy is delivered as sugar. Therefore the sugar produced in the leaves of a plant



31. If we neglect variations due to humidity, the air we breathe in is 20.95% Oxygen (O_2) and 78.08% Nitrogen (N_2,). Then there are small amounts of Argon, Carbon dioxide, Neon, Helium, Methane, Krypton, Dinitrogen oxide, Hydrogen, Xenon and Ozone. CO_2 is 0.033% of dry air. When the air reaches the lungs, some of this oxygen is transferred from the lungs to the blood, and is then transported throughout the body to be used for energy. In addition, the blood contains some carbon dioxide (a waste product) that is transferred to the air in the lungs, which is then exhaled. The result is that the exhaled air contains less oxygen and more carbon dioxide than the inhaled air. The air in the lungs also becomes humidified with water before it is exhaled. In fact, exhaled air is completely saturated with water – it contains the maximum amount of moisture, and is therefore has a relative humidity of 100%. We lose water as we breathe! The typical composition of exhaled air is about 18% O_2, 78% N_2, and 4.0% CO_2. .

must be transported to all the living cells in the plant, especially the roots.[32]

Trees don't move; they get taller as their trunks grow larger in circumference and their branches extend farther into the surrounding space. To do this, trees recombine glucose into another carbohydrate called cellulose. Cellulose is a long polymer of glucose molecules linked together. First the glucose molecules link together to form pairs, then these pairs link together to form chains more than 10,000 pairs long. These long cellulose polymers combine with other polymers and lignin (complex oxygen-containing organic polymer that, with cellulose, forms the chief constituent of wood) to form the cell walls, the actual wood itself, in the tree.

If the wood in a tree is made from cellulose, and cellulose is made from glucose, then why can't we eat wood for our energy needs? The simple answer is that humans and most animals cannot digest cellulose. The glucose molecules that make up cellulose chemically bond together, then these long strands of cellulose chemically bond as parallel strands. These cross-linked structure makes the glucose very difficult to remove and use for energy. If we eat wood, it will pass through our system undigested. That is the purpose of fiber in our diets, it will keep you regular, but it does not provide any food value since it can't be digested. Something else needs to happen with the glucose instead of using it to produce cellulose. Let's keep working on that.

Once upon a time, oxygen was the toxic gas

When photosynthesis does its job, oxygen is given off as a waste product. CO_2 and water contain more oxygen atoms than are needed to make sugar, so the excess oxygen is released as a gas. For those who think that trees are doing humans and animals a favor by giving us the oxygen we need it, it's worthwhile keeping in mind that when early green plants began to pump oxygen into the atmosphere, the gas poisoned much of the existing life on earth, killing it off. That left the playing field open for the evolution of oxygen-dependent creatures, like us. Cars and other vehicles running on CO_2 that use the photosynthesis model to generate energy will pump out more oxygen for us humans and animals. Why didn't someone think of that before we started drilling for oil and digging for coal, or covering the earth with solar panels and wind turbines?

32. I have used a radio broadcast from 2020 on WXPR in by Scott Bowe, who is the Director of Kemp Natural Resources Station in Wisconsin, as the basis of the more detailed description of how trees use glucose.

About Michael L. Sena

Michael Sena, through his writing, speaking and client work, attempts to bring clarity to an often opaque world of highly automated and connected vehicles. He has not just studied the technologies and analyzed the services. He has developed and implemented them. He has shaped visions and followed through to delivering them. What drives him—why he does what he does—is his 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.

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