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Mobility Industry
Insights by
Michael L. Sena

THE DISPATCHER

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THE NOVEMBER-DECEMBER 2023 ISSUE IN BRIEF

TWO-AND-A-HALF MONTHS after I came home to Sweden from my May "Searching for America" trip, which took me through New Jersey and Eastern Pennsylvania, I returned for a second tour of duty. This one was during the last two weeks in July, and it took me from Sweden to Boston, up to Canada, and back. I was carried in cars (mostly SUVs and pick-up trucks, all ICEs), buses, planes (including the kind that land on water), boats, all-terrain vehicles, and my own two feet (mostly clad in wading boots) to my many destinations. The trains got me to and from Copenhagen, my point of departure from Europe. The main purpose of this trip was to go fishing with my good friend and fishing partner for the past forty-nine years, whom I had not seen in five years. We went to a river in Labrador where we had fished together between 1986 and 1996. We decided to give it one last try.

I found that everyone I met on this trip is still making their choice of transport based on their own particular needs and desires, and not being influenced by either climate change activists or climate change deniers. They are asking themselves what is the best transport option that satisfies the combination of lowest cost, most convenience, greatest comfort, and fastest speed of arrival, and which fits with current conditions of time of year, weather, and time of day?

I am fully aware that I didn't need to travel to the U.S. and Canada to spend a few days fishing in the wilderness of Labrador. People do a lot of things they do not NEED to do. Do I feel better for having done it? Yes, for more reasons than I can list or explain, even to myself. I am happy to have spent the money for this trip in a way that gives people work, and to have had the experience of seeing in person my dearest friends. What else is life for?

THE DISPATCHER

Mobility Industry Insights by Michael L. Sena
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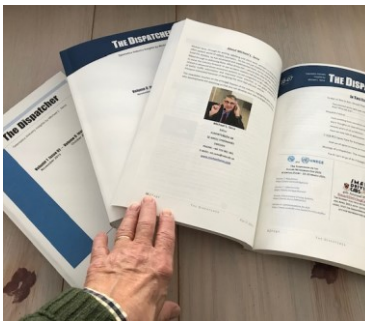
Feature: The Business of Transport Systems



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

The business shift coming for car companies

IN THE SPACE of just several weeks during this past summer in a way reminiscent of Animal Farm,[1] VOLVO CARS shattered two of its sacred strategic shibboleths: station wagons are good and vans are bad. First, it announced that it would sell only SUVs in the UK, halting the sale of sedans/saloons and estate cars/station wagons. Then, it unveiled a preview of a minivan, a model it has never built, even forty years ago when it was popular amongst customers in what once was its most important market, the U.S. It's not only VOLVO that is fiddling with their model mix. Ford has axed its Fiesta in Europe and sedans in the U.S., GM is lopping off the small stuff, and everyone is crushing their ICE.

There was a time when new vehicle designs reflected their times, and even spurred lifestyle changes (VW Minibus and flower power comes to mind). Now, it seems that companies, particularly those connected to China, are delivering what they can produce for the least amount of investment into what they believe is a seller's market for BEVs. It also seems that companies which have multiple brands, like VOLVO's owner GEELY, are treating their brands like pieces on a chess board that have rules for what they can and cannot do. At the same time, things are happening around the edges, like street-legal golf carts and all-terrain vehicles, like minicars being driven by youngsters without driver's licenses, and like bread toaster-looking vehicles lumbering around cities without drivers.

Will a single trend emerge with companies copying TESLA's original strategy of a couple of models that look pretty much alike; or will the GEELY/VW/GM/STELLANTIS concept prevail, which is to have multiple brands, each with their specialty; or will the TOYOTA

[1] Orwell, George. Animal Farm. First published by Martin Secker & Warburg Ltd (1945). "Four legs good, two legs better! All animals are equal. But some animals are more equal than others."

NOTION of one company delivering every possible type of vehicle with sub-models like *LEXUS*, selling luxury versions of some of those vehicles, be the norm?

I will begin with a personal view on how one car manufacturer, VOLVO, which, in theory, could have been where TESLA or BMW are today, successful and independent, or where SAAB is, defunct, is stuck in a supporting actor role helping up-and-comers try to reach stardom.

A time when folk and form were one

When I began working in the *VOLVO TECHNOLOGICAL DEVELOPMENT DIVISION* of AB VOLVO in January 1993, *VOLVO CARS*, then a division of AB VOLVO, had three base car models: the *400 Series* manufactured in The Netherlands[2]; the *900 Series;* and the *850*. The *400s* came in compact sedans, hatchbacks and a sportyish version, the *480*. The *900s* defined the 'box car' in sedan and estate/station wagon versions.[3] The *850* was an interim car before *VOLVO* changed its naming convention to a letter or two and two digits (e.g., V90, C40, XC60). It was a rounded box car that could be had in sedan and estate versions.

VOLVO CARS had sold 67,420 cars in the U.S. in 1992. It had a few years of U.S. sales over 100,000, but it seemed stuck in the lower tier of foreign, non-luxury cars. Vans were already well-established since the late '70s, and SUVs had begun to enter the mainstream in the U.S. in 1984 with the unibody-based *Jeep XJ Cherokee*. In 1990, the *Ford Explorer* was a big hit. Minivans were beginning to be a bit passé, and SUVs offered more status and rugged style combined with practical utility. VOLVO offered neither a van nor a SUV in 1993.

A 1984 Jeep Cherokee in a supermarket parking lot where it was a more common site than on the rugged terrain of Iceland.

The sales dial for Volvo hasn't moved much during the past thirty years, as this press release from January of this year indicates: "MAHWAH,

[2] The Volvo 440 and 460 were versions of a small family car produced by Volvo between June 1988 and September 1996. The 440 was a five-door hatchback and the 460 a four-door sedan/saloon. They were built at the former DAF factory in Born, the Netherlands and were only offered with front-wheel drive.

[3] Station wagon – An automobile with a rear door or doors, made to carry goods as well as passengers. It derives from an earlier use of the phrase in reference to a horse-drawn conveyance that took passengers (and their baggage) from and to railroad stations. 'Estate car' is a British term referring to carrying wealthy people from their estates to railroad stations.

NJ (January 5, 2023) Volvo Car USA today reports sales of 102,038 cars for the full year 2022, down 16.5 percent compared with last year. The share of fully electric Volvo cars reached 7.2 per cent during the year, up 14.3 percent over last year."

I had moved from the land of the SUV and minivan to the land of the *herrgårdsvagn* (the vehicle of the estate) and *personvagn* (passenger car). The era of carting kids to school had not yet arrived in Sweden. Many families still had only one car, and it had to pull the boat or camper in the summer, get the whole family to the ski trails in the winter, and carry the flat-packs home from IKEA. It took me a few years to appreciate the strong bond that existed between the Swedish companies developing products for the Swedish market and the people who bought those products. In early 1992, Sweden was *VOLVO*'s principal market, even though it was selling more or less the same number of vehicles in the U.S. It had close to 50% market share in Sweden, and delivered its cars to businesses and private purchasers alike. Even though its cars were sold globally, its cars reflected the lives and lifestyles of Swedes, very much like the Viking ships both reflected and enabled the lives and lifestyles of the Vikings.

Does this Volvo PV445 Duett, in production between 1949 and 1960, look more like a SUV or an estate?

A Paradigm Shift in Waterborne Vehicles

The Viking longship was something really new. Viking shipbuilders created watertight shells by first laying the keel and stems, then building up overlapping planks riveted to their neighbours (the 'lapstrake' technique) one by one. This shape was then further stabilised by ribbing which was inserted inside the planking; this whole sturdy construction method is known as 'shell building', and it was the universal way of building ships throughout northern Europe all the way until the late Middle Ages.

Their boat design along with the use of both oars and sails gave Viking boats an advantage over all other watercraft of their day in speed, shallow draft, weight, capacity, maneuverability, and seaworthiness. The addition of sails is what turned Viking ships into the quick and deadly vessels that became essential to their raiding strategies. The average longship could carry up to 120 men with 16 to 30 oarsmen on each side. Viking boats were designed to be dragged across long portages as well as to withstand fierce ocean storms. Such ships gave the Vikings the ability to trade, make war, carry animals, and cross open oceans (all the way to Newfoundland in North America) and at the same time provided sufficient protection and security for the crew.

W.W. Fitzhugh. Vikings: The North Atlantic Saga. W. W. Fitzhugh. Smithsonian Institution Press (2000).

As a new kid on the block, it seemed like an obvious move for *VOLVO* to offer a SUV, especially in the U.S. market, where SUVs were beginning their long march to dominance and both sedans and station wagons were losing ground to minivans and SUVs. After a few months in my new job, I worked up the courage to ask the head of product development for *VOLVO CARS*: "Why doesn't *VOLVO* build a SUV or a minivan?" As he prepared to respond to my question, his face turned the color of his hair, his light blue eyes darkened, his entire body stiffened. "Volvo will never build an unsafe car, and SUVs are as unsafe as they come, for the people riding in them and for everyone outside," he exhaled in one breath with indignation in his voice, then continued. "Minivans aren't much better. They're just fast food restaurants on wheels."

There wasn't any purpose in pursuing this discussion. He was expressing the viewpoint of the company's management, which he helped to form, and that viewpoint would prevail until *VOLVO CARS* became an American company in 1999 when it was acquired by FORD MOTOR COMPANY. The first thing FORD did when *VOLVO* became its subsidiary was to order it to build a SUV. The *XC90* was the result. It previewed its *Adventure Concept Car* at the January 2001 *NORTH AMERICAN AUTO SHOW (NAAS)*, and in November 2001 released its first images. Its full unveiling occurred at the 2002 *NAAS*, and it was launched the following year. In 2003, it won the *NORTH AMERICAN CAR OF THE YEAR* award and *MOTOR TREND MAGAZINE'S SPORT/UTILITY OF THE YEAR*. It sold over 40,000 units that year in North America, half of all sales for *VOLVO* in that market. It would be an understatement to say that the model was a hit. I would go so far as to say that it saved the company and kept it going through the eleven FORD years when it was starved for investment and its best bits were used by FORD to bolster its own models.

Volvo's first sport utility vehicle was the XC90, which went on sale in 2003.

Creative destruction or destructive creation

During the ten years that Håkan Samuelsson was CEO of *VOLVO CARS*, from 2012 to 2022, after it was acquired by ZHEJIANG GEELY HOLDING GROUP, the subsidiary company had one goal, which was to reach global sales of one million cars. It was going to reach that goal by building vehicles that customers wanted to buy, and those were mainly

SUVs in all different sizes. However, it continued building station wagons, which proved to be important in Sweden, and sedans, which had strong sales in many European countries as well as in China. It even built an extra long version of the S90 for the chauffeured Chinese executives. It might have gotten to a million if COVID-19 hadn't struck. Sales topped 700,000 in 2019; they had been 422,000 in 2012. Things were going swimmingly until its owner, Li Shufu, decided that it was time to pull as much money out of the company as he could get through a stock listing without giving up too much of its ownership. That meant building a story of the company for investors that did not at all match its then-current track. It was going to be an all-BEV company within a few years, and it would have to accept that it was going to be one of GEELY's many brands and contribute its best bits to the others.

Once the IPO happened in 2021 and Mr. Li (technically, ZHEJIANG GEELY HOLDING COMPANY) got $1.8 billion for selling 18% of Volvo, Håkan Samuelsson was shown the door, and someone from outside of the automobile industry, Jim Rowan, was brought in to dutifully execute the GEELY strategy for the company.[4] According to the latest message from VOLVO, its mission is to provide people with "the freedom to move in a personal, sustainable and safe way". Building safe cars, which had been its principal selling point for most of its history, is relegated to being just one among other ambitions. All cars are personal by definition. Sustainable is attached to everything from vegan meat to walking barefoot, and has therefore become meaningless. Its stated strategy is: "fast growth; electrification; direct consumer relationships; leading new technology; fastest transformer".[5] This strategy could apply to a vacuum cleaner company that sells its products door-to-door.

This summer, Rowan announced that VOLVO would stop selling sedans in the UK. In June, the *S90* and *Cross Country* versions of the *V60* and *V90* were taken off the showroom

[4] Jim Rowan was CEO for Ember Technologies, a temperature control maker, when he was named CEO of Volvo Cars. He was also CEO of Dyson, known mostly for its vacuum cleaners, between 2017 and 2020.

[5] https://www.volvocars.com/intl/v/our-story

floors. In August, it removed the S60 saloon and the remaining V60 and *V90* estates. Why? *"We continue to rapidly transform our product offer, which means not only moving towards full electrification, but also shifting to new platforms and technologies across all our cars,"* said the company in a statement. *"We will naturally need to evolve and consolidate our line-up as we prioritise fully electric cars and make this technological transition."*[6] *VOLVO UK* claimed that "saloons and estates" accounted for less than 10% of sales in the UK, and that the *XC40*, *XC60*, and *XC90* were the main sellers in their respective market segments.

In China, they get what they want, while others get what they need

As choice has diminished in the UK for VOLVO customers (and where next?), VOLVO announced that it would build a van and sell it for the time being only in China. The company has given it a name, calling it the *EM90*, and refer to it as an MPV. 'EM' stands for 'electric minivan', and 'MPV' is 'multi-purpose vehicle'. The *EM90* will debut this November in China. Why not elsewhere? Their sell-by date passed quite a long time ago in the U.S. and Europe, but apparently VOLVO believes that it will sell enough of them in China to make it worth their while. But why GEELY feels VOLVO needs to offer a minivan in China when its so-called luxury brand, *ZEEKR*, has already introduced one, the *Zeekr 009*, is a real mystery.

This is the Zeekr 009. Remind you of anything, the Ford Flex, for example (shown below), which was sold by Ford between 2009 and 2019?

One can also wonder why GEELY needed to create either POLESTAR in 2017 or *ZEEKR* in 2021 when VOLVO could just as easily have filled the needs that either of those brands are attempting to meet (and maybe have gotten to a million in sales) is an even bigger mystery. Unravelling this mystery and determining whether it is a strategy for success or failure—compared to the other strategies that have evolved—is what follows.

The New Millennium ushered in a new car era

In the past, in what I will call the *Before China* (or *BC*) *Era*, car companies continued to stay in business because they satisfied customers' needs better than their competitors. When they stopped doing that, they were either acquired for their good bits, like CHRYSLER buying AMERICAN MOTORS to get at its *Jeep*—and then PSA doing the same thing to FIAT

[6] https://www.topgear.com/car-news/suvs/volvo-uk-has-killed-all-its-saloons-and-estates

CHRYSLER—or they simply folded up their tents and disappeared, like SAAB. In the *AC* (*After China*) *Era*, which began about the time China joined the *WORLD TRADE ORGANIZATION* on the 11th of December 2001, companies may die, but their names live on. People are buying MGs in the firm belief that they are buying a UK MG, but they are actually buying a Chinese SAIC vehicle with an oversized MG badge on it. NANJING AUTOMOBILE GROUP, a Chinese state-owned company, bought the rights to the MG brand in 2005, along with other MG ROVER assets. NANJING then merged in 2007 with SAIC, another Chinese state-owned company, so SAIC took over all of NANJING's rights. There is no production of MGs in the UK. The only UK legacy of MG is an office address in London.

Re-badging is nothing new. FORD put a JAGUAR badge on its *Mondeo* and called it a *Jaguar X-Type* (see sidebar), and GM put a SAAB badge on a *Chevy Trailblazer* and called it a *Saab 97X (UGH!)*. Those moves, as we know, did not turn out so well. Li Shufu's GEELY hasn't bought names; it's bought whole companies. But he seems to be playing a similar game of using the companies he has bought to play the same game as FORD's Jacques Nasser was doing with all of his little toy cars that he gathered together into the *PREMIER AUTOMOTIVE GROUP*, which included *ASTON MARTIN*, *LINCOLN*, *JAGUAR*, *LAND ROVER*, and (drum roll) *VOLVO CARS*. Bill Ford put a stop to the silliness and replaced Nasser with himself. The auto industry, at least in the west, settled back into its my-car-is-my-car and your-car-is-your-car routine.

The re-badged Ford Mondeo as a Jaguar X-Type. I wonder if the Jaguar exec who let this slip through is invited back to Jaguar events. He was probably evacuated by Ford when India's Tata took over.

Something happened on the way to the car dealership

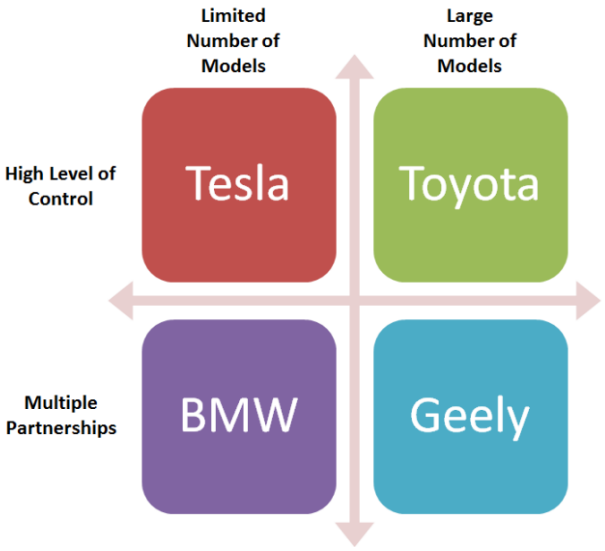
It's been quite a ride the Planet and its inhabitants have been on since the start of the New Millennium. Beginning with the September 11th terror attacks in 2001, there has been one war, financial, or climate crisis after the other. In the midst of all of these crises, the business of life and the life of business have continued. The making and buying of automobiles has been no exception, but both the making and buying of automobiles has been transformed. Between January 1999 and about the time COVID-19 struck, five events occurred which created the preconditions for fundamental changes that we now see in the automotive industry:

- China
- TESLA

- GM's and CHRYSLER's Chapter 11s
- Dieselgate, and
- The combination of the mobile Internet and Internet-based services.

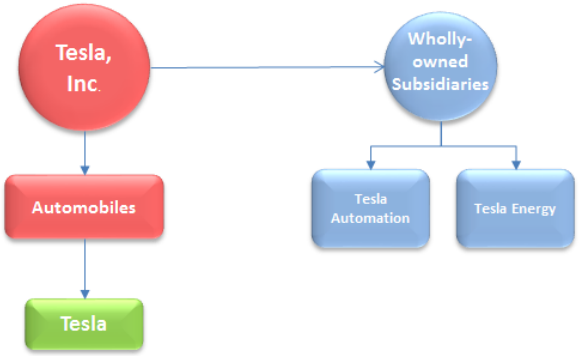
China decided it was going to be the largest automobile manufacturer in the world, and then it determined that it could best do that by being the center of battery electric vehicles and related technology. TESLA showed that it could make a BEV and then figured out how to get it into the hands of customers, with its own charging network and government handouts to buyers. The threat of bankruptcy for two of the U.S. Big Three automakers, and their bailouts by the government, left them weakened and rudderless in an increasingly turbulent ocean of competition. They were unable to respond to either the brash moves by TESLA's Musk, who claimed that only BEV-based electrification of automobiles would save humanity from climate change, or the forward march of China using TESLA's coattails to give it a running start with BEVs. Dieselgate, with VW as the most visible guilty figure, sealed the fate of internal combustion engines when, as part of an apparent plea bargain, VW agreed to do penance by stopping its production of ICE vehicles, pushing the entire automobile industry into BEV mode. Mobile Internet and related services fulfilled the dream of the *dot.com* advocates—and rehabilitated Jacques Nasser's image—of the car being a mobile phone on wheels. The car companies no longer had complete control of the car or the buyers of their cars. THAT'S MY TAKE ON TWENTY YEARS IN A NUTSHELL.

There are now four types of automotive companies that coexist and compete, as illustrated with an example of each type in the diagram to the right. I have categorized them according to the number of models they build and the level of control they exert over the design, production, sales and servicing of their models. Most of the largest automobile companies fit within the two categories on the right side of the diagram, but there are significant differences between those that exert a high level of control and those that depend on multiple partnerships.



TESLA has the highest amount of control over its processes of any current car company, designing and producing almost everything in-house, from batteries to software, rivalling FORD's legendary vertical integration in its early days. It also has only four models within one brand, *Tesla*. It will have five when it finally starts delivering its *Cybertruck*, which is not yet on the market. It is also worth noting its mission and its strategy. Its mission is "to accelerate the world's transition to sustainable energy", and its strategy to accomplish that mission is "to change the fundamental design of a product that people want—a car—from being a contributor to pollution to being climate neutral". (That's quite a contrast to VOLVO's statement.) It has two subsidiaries, TESLA AUTOMATION and TESLA ENERGY, which support its automobile business.

Tesla, Inc. - August 2023



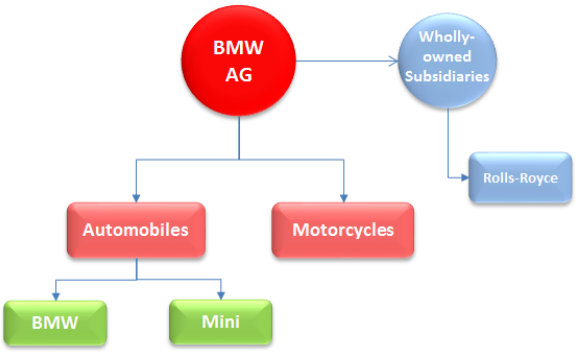
TESLA ENERGY OPERATIONS, INC. is the clean energy division of Tesla, Inc. that develops, manufactures, sells and installs photovoltaic solar energy generation systems, battery energy storage products and other related products and services to residential, commercial and industrial customers.

TESLA AUTOMATION GMBH (formerly Grohmann Engineering GmbH) is a German engineering automation company that makes machinery for the production of microprocessors and memory chips, airbag sensors and power steering controllers, as well as systems for the production of car door and roof seals, lithium-ion battery cells and modules, and manufactures robotics that are used in the production of batteries and electronics.

TESLA delivered 889,000 cars in the first two quarters of 2023, compared to 749,000 during the same period in 2022. It is on track to deliver 1.8 million for the full year, compared to 1.37 million in 2022. It was the 15th largest automobile company in the world in 2022, just behind GEELY AUTO, having moved up from 18th place in 2021 and 27th place in 2020.[7]

BMW also has a limited number of models under its two brands, BMW and *Mini*. *Mini* is a leftover from its 1994 purchase of the BRITISH ROVER GROUP, which included *Rover*, *Land Rover*, *Mini*, and *MG*. It sold all of them except *Mini* by 2000. It makes and sells motorcycles as well under the BMW brand name. It also has a subsidiary car manufacturer, ROLLS-ROYCE, which it acquired in 2003.[8]

BMW AG - August 2023

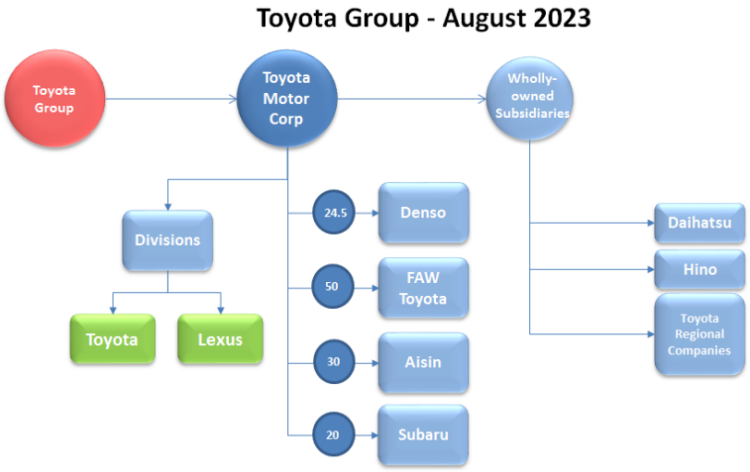


[7] https://www.factorywarrantylist.com/car-sales-by-manufacturer.html - global sales figures for 2022.

[8] The reasons BMW purchased Rolls-Royce are complicated and related to its competition with fellow German automaker, VW, and with the whims of the former owners of both Rolls-Royce and Bentley, which VW

One difference between BMW and TESLA is the degree of control they have over their production processes. BMW is similar to most automobile manufacturers in its reliance on Tier One suppliers, who are, in their turn, reliant on Tier Two suppliers. BMW is also open to using contract manufacturing of its vehicles. However, it makes its own engines and relies heavily on in-house engineering and programming of its infotainment and safety systems.

TOYOTA has extremely tight controls over its production processes, as well as over the entire marketing, sales and service functions. It has major ownership positions in two of its principal Tier One suppliers, DENSO and AISIN. It has only two automotive brands, *Toyota* and *Lexus*, and it is clear to customers that when they buy a *Lexus* they are buying a *Toyota* that has been tweaked in performance and finish to make it worth paying a bit extra for it. HONDA, HYUNDAI/KIA, and FORD are similar to TOYOTA in having only two brands, *Honda* and *Accord* for HONDA, *Hyundai* and *Kia* for HYUNDAI, and *Ford* and *Lincoln* for FORD. Although Toyota and these other companies have only two brands each, they have a large number of models.



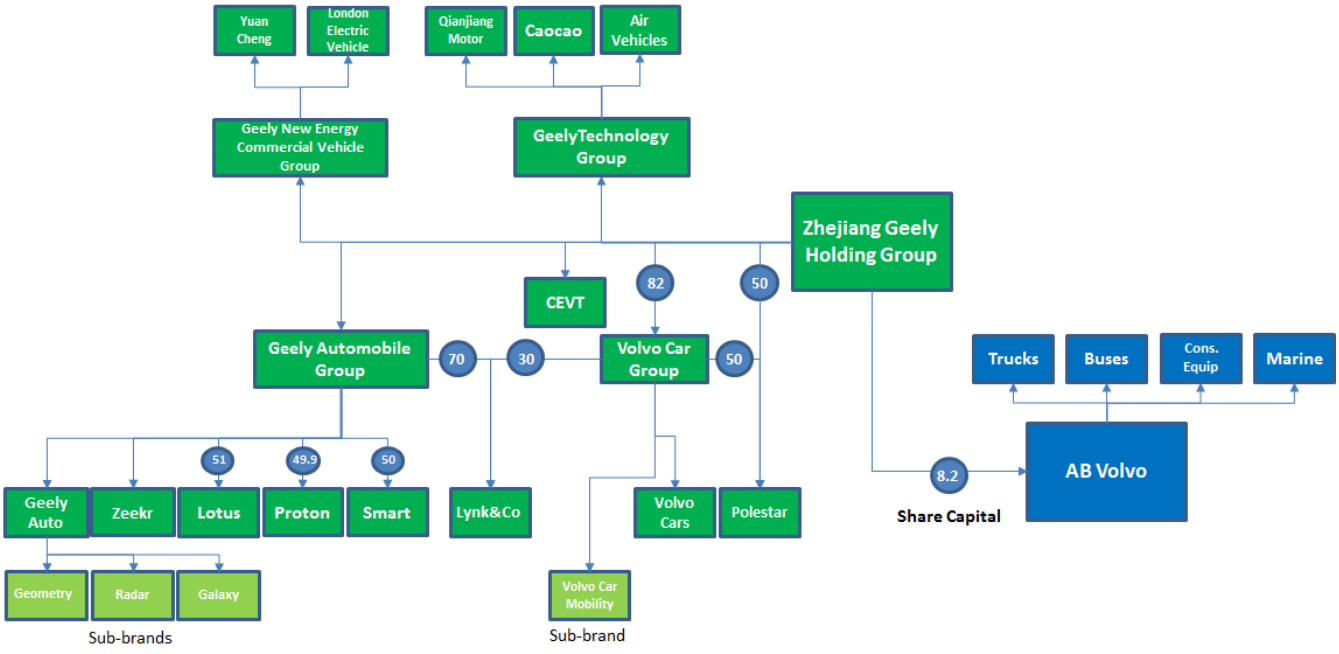
TOYOTA has been number one in global sales for the past three years, taking over the top spot from VW, which held it for four years, from 2016 to 2019.[9] It has spread its production facilities around the globe, develops specific models for many of its markets, and even limits the sale of certain models to countries within markets. We owned a *Toyota Corolla Verso* crossover for sixteen years that we purchased in 2006 which was never sold in the U.S. TOYOTA got to where it is by delivering the best total car ownership experience, not by being the least expensive or having the flashiest accessories.

ended up acquiring. The first car that Rolls-Royce built after its acquisition by BMW, the Phantom, was engineered in Munich and was powered by a BMW V-12 engine, but like its predecessors it was a bespoke car produced in a new factory built for it by BMW in Goodwood, UK.

9 https://www.thedetroitbureau.com/2022/01/toyota-remains-the-worlds-largest-automaker/

ZHEJIANG GEELY HOLDING GROUP (**ZGHG**) has carried the GM model of multiple brands to the extreme. While GM has lopped off half of its brands, including *SATURN*, *PONTIAC*, and *OLDSMOBILE*, closed its Australian subsidiary, HOLDEN, and sold its European business, OPEL, GEELY has been on a buying spree since it acquired *VOLVO CARS* in 2010. Between its GEELY AUTOMOBILE GROUP and its VOLVO CAR GROUP, it has eight car brands and four sub-brands. It also has set up a "new energy" commercial vehicle group into which it has placed its *LONDON TAXI* purchase, which has converted its iconic diesels to BEVs. On top of this, ZGHG has an 8.2% share capital position in AB VOLVO, the company that sold *VOLVO CARS* to FORD in 1999. It also had a 9.7% share capital position in DAIMLER AG, but it sold its shares when DAIMLER formed two companies, one for cars, MERCEDES-BENZ GROUP, and the other for commercial vehicles, DAIMLER TRUCKS.

Zhejiang Geely Holding Group (Automotive) – August 2023

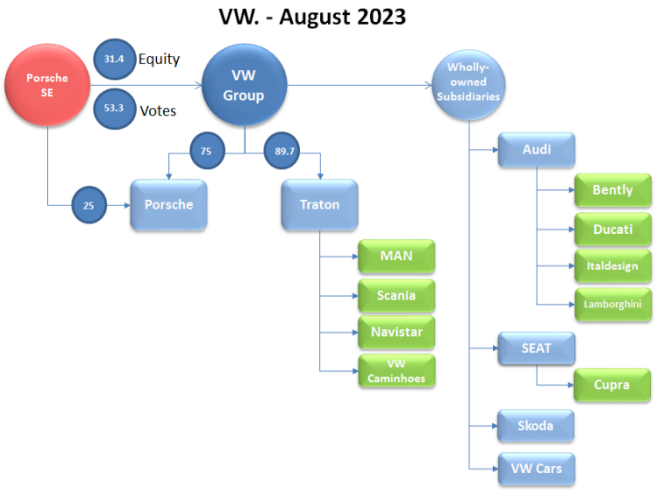


2023-08-29 European Automotive Telematics Landscape

When Apples Aren't Always Apples

Most global car sales lists, like the one referenced in footnote 7, show sales for Geely as sales only for Geely Automobile Group, not for the entire Zhejiang Geely Holding Group. The entire group had sales of 2.3 million units in 2022, of which Geely Auto had 675,000, Volvo Cars 615,121, Polestar 51,500, Zeekr 72,000, Lynk&Co 180,127, Livian

56,140, Geometry 149,389, and an undetermined number for London Taxi and the other partly-owned brands. This is not the case for VW. VW's sales of 8,263,104 for 2022 include those for VW Cars, Skoda, SEAT, Audi and Porsche. If all of ZGHG sales are included, it ranks somewhere below Nissan, which was in 8th place in 2022, and Renault, which was in 11th.



ZGHG has an explicitly-stated strategy and an implicit one. Its explicit strategy was stated by Li Shufu (who has taken to calling himself 'Eric' Li, perhaps as a tip of the hat to all that Sweden has given him) in a June 2023 statement:

"At Geely Holding, we are guided by our core values: truth-seeking, hard work, collaboration, and innovation, to respond proactively to our changing environment and business landscape. We work relentlessly to strengthen our core competitiveness through technological innovations, ecological developments, win-win collaborations, and improved global corporate governance. We also uphold and practice ESG[10] to ensure a better world for everyone."

ZGHG's implicit strategy is more important for understanding how the companies within the group must function. Li has shown that his most important objective is to extract as much capital as possible from each of the companies he has acquired by listing them on a stock market somewhere in the world while at the same time retaining controlling interest in the companies. VW has done this with PORSCHE, retaining 75% of the PORSCHE, and STELLANTIS did it with FERRARI, with EXOR N.V. retaining 24.21%. EXOR N.V. owns 13.99% of STELLANTIS. EXOR is controlled by GIOVANNI AGNELLI B.V., which owns 52.01% of the company.[11] ZGHG is listed on the Hong Kong Stock Exchange Hang Seng index. Li has so far done it with GEELY AUTOMOBILE HOLDINGS (Hong Kong),

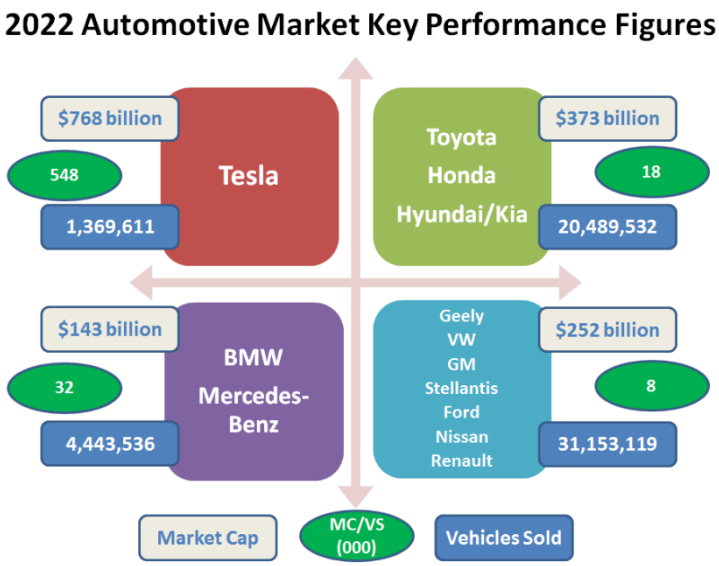
[10] ESG stands for *Environmental, Social, and Corporate Governance*. It is a set of aspects considered when investing in companies that recommends taking environmental issues, social issues and corporate governance issues into account.

[11] On 11 July 1899, Giovanni Agnelli was part of the group of founding members of FIAT, FABBRICA ITALIANA DI AUTOMOBILI TORINO. Agnelli led the company until his death in 1945.

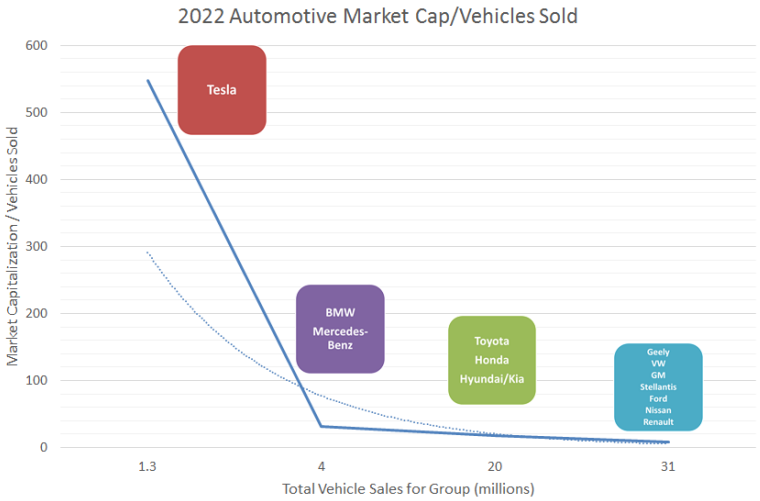
VOLVO CARS (Stockholm), and POLESTAR (NASDAQ), and is about to do it with ZEEKR.

The defining moment for car companies is now here

Will all of these approaches continue to exist in parallel, or will one or more of them fall by the wayside? If we look at how investors view the prospects of the companies, their market capitalization is a good indicator. I have summed up the market caps of each of the companies in the four clusters as they were in early September 2023. TESLA had a market cap of $768 billion, which was about double the value of the TOYOTA cluster of companies, triple that of the GEELY cluster, and more than five times the value of BMW and MERCEDES-BENZ. TESLA, on its own, represents approximately 50% of the total market capitalization of the top twelve companies in the automobile business.



Looked at from the ratio of market cap to vehicles sold, TESLA is either extremely overvalued, or investors believe they are on to something, especially compared to the companies in the lower right-hand corner, the GEELY cluster. In second place in MC/VS are BMW and M-B, with combined vehicle sales of over three times that of Tesla, but a MC/VS ratio that is 17 times lower. Charting market cap per vehicle and total sales shows a clear inverse relationship between the cluster's total sales to its MC/VS value.



If I were making bets (Isn't that what making investments is all about?), I would bet that in the very near future, all car companies on the right side of the chart will start to look more like the companies on the left side, and that all car companies will begin to resemble TESLA. It has already begun.

Why can't a Ford be more like a Tesla

FORD's Jim Farley is taking some tips from Musk's playbook. He has understood that there is a reason TESLA is making money by selling only BEVs, while no other western company has yet been able to do so. It is by controlling much more, if not all, of the supply chain. Musk—no fan of management consultants—never bought into the idea of concentrating on "core competencies" and outsourcing everything else, which the automotive industry swallowed hook, line, and sinker.[12] From the get-go, Musk realized that TESLA had to minimize its dependencies on suppliers of both its batteries and its charging because the batteries represented more than one-half the value of the cars, and without a charging network in place, no one would buy his cars. To produce the batteries, TESLA needed both the materials and the processing, and Musk was careful to use initial suppliers that would not require him to give away the keys to the kingdom, as any of the Chinese suppliers would have done.

FORD is now negotiating with mining firms to ensure that it has the battery minerals it needs to produce its batteries. It has signed deals to guarantee supplies of 90% of the lithium and nickel it needs for the 2 million BEVs it intends to produce annually by 2026.[13] Ford will be processing its lithium in the U.S. and making batteries in Michigan so that it will be able to take advantage of the "made in America" terms of the *Inflation Reduction Act* passed this year. GM and VW are also building their own battery-making facilities.

Another TESLA play is a minimal number of models with all of them sharing the same basic design and components. FORD's new BEV architecture will have the same software and mechanical foundations for all of its vehicles. FORD's next electric pickup will have only one cabin, one frame and one standard battery for only seven formats. Today, its options list for its top-selling ICE F-150 pickup has what could effectively be called an unlimited numbers of combinations.

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[12] It was Gary Hamel and C.K. Prahalad in their book The Core Competence of the Corporation that they made the case for companies to decide what they had that was difficult to imitate by competitors, and what they did that made a "significant contribution to the perceived customer benefits of the end product", and to jettison everything else.

[13] *Schumpeter: Ford's Focus*. *THE ECONOMIST JUNE 17TH 2023*.

There appears to be a limit to how far FORD's Farley is willing to go to emulate TESLA and thereby try to duplicate its success. He's not going to have FORD developing its own infotainment solutions, as TESLA has done. TESLA does not integrate or support APPLE's *CarPlay* or Google's *Android Auto*. It has its own infotainment solution that requires no license fees to be paid or versions with which to keep up with. FORD is not going to throw APPLE or Google under the bus. FORD is also not going to develop its own charging network. It has signed an agreement with TESLA to use TESLA's North American *Supercharger* network, which has a total of 12,000 charging stations. GM, MERCEDES-BENZ, NISSAN, POLESTAR, VOLVO, RIVIAN have signed a similar deal with TESLA.

Tesla giveth and Tesla can taketh away

Are FORD and the other companies that have signed up for TESLA charging simply moving from one frying pan into another? Signing agreements with TESLA will certainly help TESLA's bottom line and move its market cap needle, but it does not look like it will do anything for the FORDs and GMs. And, as Musk has shown with his *STARLINK* satellite network and his TWITTER (renamed X or something), he can decide to turn it off or leave it on when it suits him.[14] Maybe depending on Musk's good will as a supplier is not the best long-term strategy.

Can BMW and MERCEDES-BENZ prosper in the position they now have, with a continued heavy dependence on suppliers? With only four models, TESLA is licking at their heels. Their buyers have been loyal, and a BMW or M-B customer is never going to be satisfied by the chintzy quality of Teslas, both inside and out. However, *Tesla* buyers are buying quality; they are buying a thumbs up from Musk and the Musketeer Club. There is no question that you are driving full electric when you buy a *Tesla*, whereas there will always be hesitation when you drive up in a *M-B* or *BMW* because it actually looks like an *M-B* or *BMW* (except for that first burp that BMW emitted, the plug-in hybrid i3).

[14] *Elon Musk abandons threat to cut off satellite Internet service to Ukraine*. *NEW YORK POST*. October 16, 2022. https://nypost.com/2022/10/16/elon-musk-drops-threat-to-stop-satellite-internet-service-to-ukraine/

It's the lower-right group that looks to be the most vulnerable long-term, especially ZGHG, which appears very over-extended. Its stock listing of its brands looks more like frantic attempts to bring money into the Group to feed its financial needs. Now, with the its Chinese brands like *ZEEKR*, *LYNK&CO* and GEELY AUTO entering the market, they will be competing with VOLVO and POLESTAR, so rather than VOLVO having a real chance at passing a million in sales, it will be another knife in the drawer, and maybe not the sharpest one.

VW also looks extremely vulnerable if more governments in Europe push subsidies for BEVs. Its top-selling car globally in 2022 was its *Tiguan* SUV. Then comes the *Passat* sedan and then the Chinese-designed *Lavida*. In Europe, the little SUV, the *T-ROC* is the top-selling SUV. Electric cars of all types are less than 10% of its total sales. They are growing, but it's clear that they are not conquest sales because the company's total is not growing.

The biggest decision that all of the companies in the High Model Numbers/Low Control group are going to have to consider is whether they continue their dependency on their suppliers, or if they are going to take back more of the value components in their vehicles. To do that, they are going to have to admit that their predecessors' shedding of competencies was just plain wrong. It's not just batteries that they need to be building—and the materials for these batteries they need to be sourcing. They need capture every nickel and dime of value of what goes into building, selling and maintaining their cars.

Keep your eyes on number one

TOYOTA has been in the electric car business continuously since the launch of its first *Prius* model in December 1997, longer than any other carmaker. Its own market capitalization is almost equal to the combined market caps of all the other eleven companies included in our analysis, excluding TESLA. What does this have to say about its future strategy?

"Toyota believes that there is more than one option for achieving carbon neutrality. It also believes that the means of reducing CO2 emissions as much as possible and as quickly as possible while protecting the livelihoods of its customers vary greatly depending on the country and region," Toyota said in its statement made in August 2022 when it announced it would invest $5.6 billion

to build EV batteries in U.S. and Japan. *"With such in mind, Toyota will continue to make every effort to flexibly meet the needs of its various customers in all countries and regions by offering multiple powertrains and providing as many options as possible."*[15]

In other words, TOYOTA will continue to produce ICE vehicles alongside its hybrid, plug-in hybrid, BEV, hydrogen and any other option that makes business and environmental sense. Just like TOYOTA has not followed blindly the advice of business gurus who make their big bucks by claiming they have seen the light which they are happy to share with others, it has not bought into Musk's pitch that only BEVs can save humanity while letting us continue to drive cars.

TOYOTA continues to have showrooms where its models can be seen and where knowledgeable sales people can help customers decide which model is best for them; it puts an enormous amount of effort into ensuring that its post-purchase service is affordable and of the highest quality (I can personally attest to that fact); it makes safe and economical vehicles that are aimed at the particular requirements of the markets in which they are sold; and the company does not include systems in its vehicles that do not work, and therefore does not take money for future promises as TESLA has done with its so-called "full self-driving". This is all reflected in the value of the company in the eyes of both investors and consumers.

TOYOTA is the alternative to TESLA. If it can avoid a VW-type "Dieselgate", a GM-type economic meltdown, and a dumping attack by Chinese brands, I bet it will be the global automotive leader that makes it first to 20 million vehicles sold, not TESLA as Musk claims. Of course I would say that, wouldn't I? My wife and I own two TOYOTAs and zero TESLAs. As I said, making an investment is the same as making a bet.

[15] https://edition.cnn.com/2022/08/31/business/toyota-ev-battery-plant/index.html

Dispatch Central

THE DISPATCHER

Mobility Industry Insights by
Michael L. Sena
November-December 2023
Volume 11, Issue 2

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.

Critical materials as competitive weapons

WHEN YOU ARE dealing with a competitor that has a stated policy of complete domination of your market, you should be prepared for that competitor to use whatever powers it has at its disposal to put you out of business. If that competitor happens to be a country with 20% of the global population, produces at least half of every consumer product that is consumed in the world, and controls almost all of the raw materials you need to produce your product, you might reckon that your chances of staying in business are close to zero. That's the position that Swedish electric car battery producer, NORTHVOLT AB, finds itself in. This was the topic of an article in the June 22nd issue of *THE ECONOMIST*, and it was then the subject of an editorial in Sweden's major newspaper, *DAGENS NYHETER*. The country and competitor is CHINA, INC.

NORTHVOLT AB is a Swedish battery developer and manufacturer specializing in lithium-ion technology for electric cars. It was founded in 2015 as SGF ENERGY by Peter Carlsson, Paolo Cerruti, Harald Mix, and Carl-Erik Lagercrantz with headquarters in Stockholm. Carlsson and Cerruti were working at TESLA MOTORS in Supply Chain and Operations Planning prior to forming SGF. In 2017, SGF ENERGY changed its name to NORTHVOLT AB[16]. Carlsson is currently CEO, Cerruti is COO, and Lagercrantz is Vice Chairman of the board. Mix has moved on.

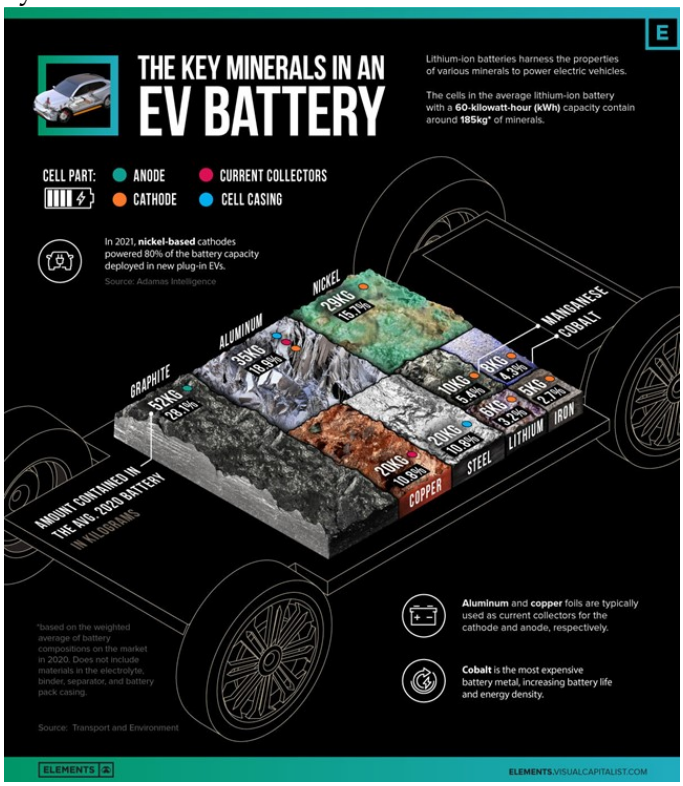
Background to founding

Carlsson and Cerruti are the true founders of NORTHVOLT. Carlsson was VP of Supply Chain at TESLA from June 2011 through October 2015. Here is what TESLA wrote about Carlsson when he was hired:

[16] www.northvolt.com

"At Tesla, Peter will lead all supply chain and purchasing efforts for Tesla's future vehicles, ensuring quality, cost efficiency and timeliness of all supplies used in Tesla products." He worked with the industrialization and launch of the *Model S* with over 300 suppliers. He turned a negative gross margin into a 28% surplus within the first year of production. He left to get involved in a series of cleantech and automotive start-ups in Palo Alto, California. The story is that after four years of working under Musk, he felt if he was going to work himself into an early grave, he might as well decide himself how quickly he would get there. It was shortly after he left that he and Cerruti started their battery venture.

NORTHVOLT's goal is to be the principal supplier of batteries for battery electric vehicles in Europe, competing with Chinese companies CATL and BYD, South Korean LG CHEM, Japanese PANASONIC, and, of course, TESLA. It has targeted 25% of the European BEV battery market share by 2030, and claims to have secured over $27 billion worth of contracts from key customers. It currently has 5000 employees and is privately owned. VW owns 20% of the company and has a seat on the company's board of directors. Others that have made investments are BMW, SCANIA (part of VW), and AB VOLVO. VOLVO CARS and NORTHVOLT established a JV in 2022 to build batteries in Sweden.



There is just one small detail: battery minerals

In discussions about the mineral content of battery electric vehicles, the conversations usually focus on lithium and cobalt. Cobalt is the most expensive battery metal, as stated in this diagram. Lithium is an alkali metal, along with sodium, potassium, among others. Lithium and cobalt represent respectively 3.2% and 4.3% of a BEV battery by total weight. Only iron in the cathode represents less. The heaviest components in a battery are graphite (28.1%), aluminum (18.9%), and Nickel (15.7%). These three minerals are chiefly mined and/or processed in China. According to the U.S. GEOLOGICAL SURVEY, world production of natural graphite in 2022 was 1.3 million tons. Of that total, 850,000

or 65% was mined in China, 13% in Mozambique, 8% in Madagascar, 6% in Brazil, and 1% in North Korea. That's 93%. Canada and Russia add another 1% each. There is a tiny amount of mining in Austria and Germany, and none is mined in the U.S. When it comes to processed graphite for BEV batteries, China produces 98% of the final processed graphite material to make battery anodes.

Since 2020, according to *THE ECONOMIST*, exports of graphite to Sweden have successively been reduced. Certain types of graphite are no longer delivered to Sweden. Apparently, there has been no official statement from CHINA, INC. of an official ban on exporting graphite to Sweden, but one Chinese exporter who was interviewed for *THE ECONOMIST* article said that he was informed by the Chinese authorities that there would be no export licenses issued any longer for exports of graphite to Sweden.

There has been speculation that the reason for the unofficial ban is Sweden's outspoken criticism of China's treatments of the Uyghur people in its Xinjiang province. It is also judged to be due to the political tiff over China's kidnapping of Swedish citizen Gui Minhai in 2015 and his detention in China since then, in spite of efforts by Sweden's foreign ministry to obtain his release. This would fit what has been termed 'weaponized interdependence', when China uses its economic dominance to force governments or businesses to toe its political line and stop any and all criticism of its actions. Sweden has increased its trade with China by 700% during the past twenty years, and Chinese direct investment in Sweden has increased by 600% during the past ten years. Have a walk around Lindholmen in Göteborg and simply observe the presence of GEELY to see where some of that money has gone, so it seems unlikely that China has stopped delivering just graphite when it has plenty of other arrows in its weaponized interdependence quiver.

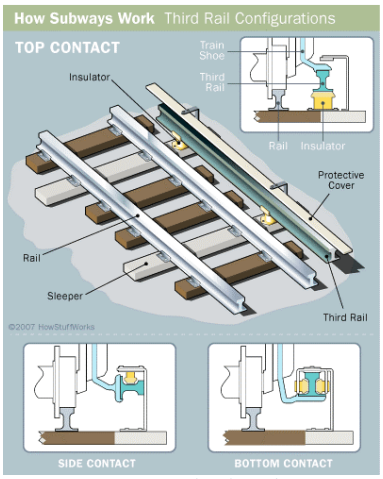
It is much simpler. CHINA, INC. sees no reason to make it easy for NORTHVOLT to make batteries, or for any of its current or potential customers to buy batteries from a non-Chinese supplier. Why should it? The world gave it the right to control everything, especially digging up dirty minerals like graphite and using dirty energy to manufacture everything. Why would they give it up without a fight?

Sweden cuts power to first electric road

WITH ELECTRIC ROAD SYSTEMS (ERS), road infrastructure supplies vehicles with electricity as they drive. The electricity can both load batteries and be used by vehicles that are suitably equipped to use the power directly. Think of electric trolleys or electric trains with overhead wires, or think of the old, and extremely dangerous, third rails that powered electric locomotives from a hot rail below or from the side (see sidebar). So, electric roads are not a new idea, but sometimes old ideas experience a renaissance, just like battery electric vehicles have done.

ERS is intended to provide a solution to electrification for heavy road vehicles, like the SCANIA tractor-trailer above.[17] Given the weight of heavy-duty vehicles (HDVs), their electrification is challenging. With today's technology, battery systems delivering the required power and driving range would be so large and heavy that they would significantly reduce a vehicles' payload and render their operation inefficient. With ERS, vehicles don't need to rely on on-board battery systems for the part of a trip that is carried out on ERS-equipped road infrastructure. In theory, this makes efficient, long-haul heavy-goods transport based on electricity more feasible. But is it practical?

There is a downside to ERS: The cost of building, operating and maintaining the infrastructure. So far, ERS have mainly



Boston MBTA Third Rail System

[17] A tractor-trailer truck, also known as a semi-truck, (or semi), big rig, or eighteen-wheeler), is the combination of a tractor unit and one or more semi-trailers to carry freight. A semi-trailer attaches to the tractor with a type of hitch called a fifth wheel.

existed on test sites, although in recent years initial tests of conductive ERS have been carried out on public roads.

How Electric Road Systems work

ERS solutions differ according to how energy is transmitted to a moving vehicle. The following three alternatives are being pursued in test applications:

- Conductive overhead catenary systems transmit energy via a pantograph mounted on a vehicle's roof, similar to the type commonly used for trains, trams and trolley-buses. The system can be integrated with and operated on the existing road infrastructure.
- Conductive rail systems transmit energy to rails in the ground and thence to the vehicle via a slide-in current collector system – a movable arm that detects the rail in the road. When overtaking, the arm can automatically raise; when stopping, the current is dis-connected.
- Inductive charging systems transmit energy from the road to the moving vehicle wirelessly via a magnetic field. They require installation of coils in the road that generate an electromagnetic field, as well as receiving coils on the vehicle for electricity generation. There is no mechanical contact between the two.

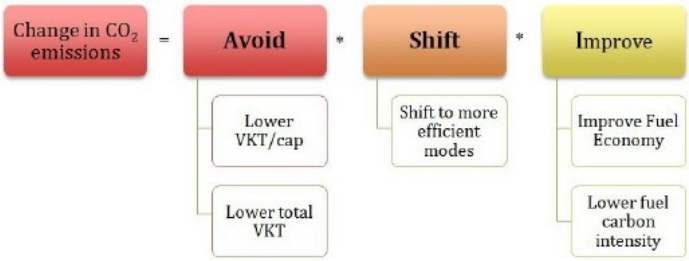
ERS Technology

Conductive overhead catenary system

Conductive rail system

Inductive charging system

There are four countries that have been seriously investigating the potential of ERS to meet their aggressive environmental goals: UK, France, Germany, and Sweden. Sweden's program has been the most advanced. As part of its climate protection strategy (and as unrealistic as it may seem), Sweden has committed to having a transport sector independent of fossil fuel vehicles by 2030. In Sweden, road traffic accounts for one-third of carbon emissions. It is that high because Sweden's electricity generation has been fossil fuel-free for generations. One-fourth of those transport emissions are attributable to heavy-duty freight traffic. The *SWEDISH TRANSPORT ADMINISTRATION* analyzed Sweden's road freight transport sector from the perspective of the INTERNATIONAL ENERGY AGENCY's *Avoid-Shift-Improve* policy.[18] That is, urban transport solutions "that allow travel to be 'avoided';



[18] Avoid-Shift-Improve (A-S-I) was first developed in Germany in the early 1990s as *vermeiden, verbessern, verlagern*. The term was first published in a 1994 report by the German Parliament's Enquete Commission.

those that 'shift' travel to more efficient modes; and those that 'improve' the efficiency of vehicle and fuel technologies." According to *STA*'s findings, viewed through this lens, it became clear that Sweden's road freight transport sector must, to a large degree, focus on the "improve" lever. Road freight traffic is unavoidable (and expected to grow significantly), and the ability to shift to other modes of transport is limited. Sweden's publicly funded road network is fifteen times longer than the publicly funded railroad system, and the coastal maritime transport is limited for inland destinations.

STA got the green light from government to build what would be the first permanent ERS, a thirty-kilometer stretch of the E20 between Örebro and Hallsberg that is a major road freight route. It was scheduled to open around the end of 2025. It put the project out to bid. When the bids came in for building the road infrastructure, the electricity delivery infrastructure, and the payment system, all the proposals were well over the budget allocated by *STA*, and a halt was called to the entire effort.

We didn't think it was going cost that much

"This is not the scenario we had imagined, but it was a necessary decision," said deputy head of the *SWEDISH TRANSPORT ADMINISTRATION*'S electrification program Kenneth Natanaelsson. "This decision affects both us, our suppliers and partners." It was decided to put the project back into an analysis phase to determine how—or, presumably, if as well—the costs can be reduced.

Funding public transport isn't working

IN THE *DECEMBER 2018 ISSUE OF THE DISPATCHER* I asked: *Is it time to throw the bus under the bus?* My answer to my question five years ago was:

"We need to start thinking outside the bus. If a city is serious about providing a useful bus service, it needs to run them everywhere and often, including at night. It must, therefore, get rid of cars driving and parking on its streets. That includes both private and commercial cars (i.e., taxis). It needs to eliminate all trucks and delivery vans parking in its bus lanes. If it cannot do these things, it should do what London and Los Angeles are doing, which is gradually taking buses out of service while their citizens find and use other options. What cities are doing today all over the world is

neither providing an adequate service to their citizens nor using the money allocated for transport in a cost-effective way."

This was written two years before COVID-19 struck and riders disembarked from all types of public transit in droves. Ridership has not returned to pre-COVID levels in most cities as a result of people working at home or having decided that the alternatives to buses and undergrounds were better. In Stockholm, a city where public transport on buses, rail rapid transit, and commuter rail had steadily increased for decades, and where riders of all ages and incomes used it for their work and leisure travel, current ridership on all modes is stubbornly stuck to levels 30-40% below pre-COVID levels and it is not budging. May 2023 figures for New York City's subway were down 29% from the same month in 2019; for San Francisco's BART, it was 63% below the same month in 2019. London was better at 87% of pre-COVID.

The result of lower ridership is naturally lower revenue from fares. Stockholm had a shortfall in 2022 of $170 million. Chicago was down $300 million in 2022 compared to 2019. It is not as if the fares collected on public transport was paying for the service. Transit services in most if not all cities anywhere are subsidized. So lower fare intake simply means that tax payers have to dig deeper into their pockets to hand over higher subsidies. Those tax payers are not just the people who live in the cities. The subsidies are coming from states and the federal government in the U.S., and from country and central government in other countries. Everyone is paying to keep the buses and trains running.

Blame the COVID-19 pandemic

There is no question that the original cause of lower ridership was the decision to require individuals who were not considered "essential workers" to work from home. This has carried forward so that even if "non-essential workers" are returning to the office, they are not going in five days a week. This has had a not-so-obvious effect on revenue for Stockholm County's transit authority. Fewer riders are purchasing what used to be called a 'Monthly Card', and which is now called a 30-day ticket. It costs 970 Swedish kronor (SEK) per month ($87). If you take the underground or a bus every day to work within the City of Stockholm area and pay for those trips with a one-day ticket costing 165 SEK, the cost

would be 3,300 SEK ($297) for the month. Because you can use the monthly card for all types of trips at any time and anywhere within the County, even on ferries, the buyer saves not only more than 2,000 SEK per month for work travel, but thousands more on other types of travel.

It is a very good deal, if, that is, you use it. But if you are only travelling into work a few days a week, buying the card is less appealing. Then you start finding other ways to travel to the places you used to travel in your leisure time, or you start finding alternatives that are closer to which you can walk, or you simply stop making certain trips. It's a vicious circle for the transit authority pushing pre-payment for travel. In Stockholm, six of ten employees are now working from home at least two days a week. They aren't buying monthly cards and they are not using public transit as they did before COVID.

Some cities and states have decided that they have reached the subsidy limit and are encouraging transit authorities to cut back services. Stockholm, London, Boston, Philadelphia, Chicago, Los Angeles, Seattle are all considering cutting service or have already done so. San Francisco has two major transit authorities: SAN FRANCISCO MUNICIPAL RAILWAY (MUNI), which runs buses, trolley buses, light-rail, and cable cars; and BAY AREA RAPID TRANSIT (BART), which runs the rail rapid transit system. Weekday ridership on MUNI is at 66% of its 2019 level, and weekday ridership on BART is at 42% of its pre-COVID level. In other words, they are down by a significant amount, which means that they require higher levels of subsidies, principally from the State, in order to keep the same level of service they have had. The hope is, of course, that if you keep running the buses and trains with the same frequency, eventually they will be full again.

California's government finances are not the best these days, what with its progressive policies on spending and its citizens and businesses leaving for greener pastures.[19] The Governor proposed to cut spending on public transport projects in the state by $2 billion to help cut its $22.5 billion deficit. Red flags (literally) were raised in San Francisco. Doomsday predictions emanated from MUNI headquarters. Twenty

[19] https://worldpopulationreview.com/state-rankings/people-leaving-california-by-state

bus routes would have to be axed if it did not receive additional subsidies, it claimed. The people came out in force. The theme (There has to be a theme, right?) for their protest was a 'Transit Funeral'. Several dozen protesters against transit spending cuts toward City Hall carrying coffins with 'dead' MUNI buses and BART cars, playing dirges on tubas, slowly beating drums, and carring "I'm so angry I made a sign" signs.[20]

Naturally, the Governor caved in to the pressure from obvious members of his constituency. Instead of cuts, the state legislature worked out a way to pull $1.1 billion out of its emissions cap-and-trade scheme to keep funding the transport projects that would have been cancelled. A win for democracy and the power of good sense? Hardly. Running empty buses and funding deficits with job crushing policies just makes the case stronger to move to where there is better management at all levels of government. If the people of San Francisco or any city want to keep their transit services, they should demonstrate their support by riding it and paying for the privilege. If they don't want to do that, or more likely cannot afford to do that, then they should be demanding that their cities find better alternatives to fixed route buses and rail.

Green light for driverless paid taxis in San Fran

OR WAS THAT light yellow or actually red? San Francisco made the transport news for another reason recently. It was the location for a request made by two companies, *CRUISE* LLC, owned by GENERAL MOTORS, and Waymo LLC, owned by Google, to offer paid rides to customers in vehicles in which there are no drivers as well as no time restrictions on when the rides could be offered. The requests by each company were addressed to the *CALIFORNIA PUBLIC UTILITIES COMMISSION* (*CPUC*), not to the City of San Francisco. This is important, and I will return to the reason why.

[20] https://www.sfgate.com/bayarea/article/sf-bart-muni-funding-funeral-18133982.php

Permission had been granted in 2020 and then again in 2021 by the *CPUC* for both of these companies to offer driverless rides with no time restrictions, but they had not been authorized to collect fares from their riders. Since 2022, both Waymo and *Cruise* have delivered driverless rides in California "pursuant to the authority from the *CPUC*'s *Phase I Autonomous Vehicles Passenger Service Driverless Deployment* program, and within the Operational Design Domain (ODD) approved by the *CALIFORNIA DEPARTMENT OF MOTOR VEHICLES*."[21]

Even though it is the U.S. National Highway Traffic Safety Administration (NHTSA) that sets the safety standards for every motor vehicle operating on public roads in the U.S. – and that includes vehicles without drivers – it is the state departments of motor vehicles that establish the regulations for testing and deployment of driverless vehicles on the state's roads. California's DMV decided that Waymo and Cruise met its own safety standards within the ODD it had established in its 2020 and 2021 resolutions, and therefore agreed to hear their requests for extending the authorizations to receiving payment for rides.

Here are the existing parameters under which the companies operate, and these are not changed by the addition of payment for rides:

- Waymo Operating Speed and Conditions: Waymo is authorized to operate at speeds up to 65 miles per hour (mph), including in rain, fog, and inclement weather, throughout San Francisco and a portion of San Mateo County.
- Cruise Operating Speed and Conditions: Cruise is authorized to operate at speeds up to 35 mph in the City of San Francisco, except in extreme weather conditions such as heavy fog, sleet, rain, or smoke.
- Pickup and drop-off locations: Pickup and drop-off more than 18 inches from the curb creates hazards for passengers and surrounding road users, blocks the flow of traffic, and creates accessibility challenges for persons who may need or want direct access to the curb.
- Fares: The CPUC's decisions allow the AV companies to fare-split for shared rides but do not put any restrictions on how fares can be structured.

On the 11th of August, the *CPUC* conducted a hearing in which its four commissioners heard arguments for and against granting the companies' request to charge for rides

[21] DAVIS WRIGHT TREMAINE LLP. Artificial Intelligence Law Advisor, https://www.dwt.com/blogs/artificial-intelligence-law-advisor/2023/08/waymo-cruise-autonomous-vehicles-san-francisco

in San Francisco. Hundreds spoke during the six-and-a-half hours (!) of testimony. When everyone had had their say, the *COMMISSION* voted 3-1 in favor of allowing them to do so. These approvals were granted in the form of 'resolutions', Resolution TL-19144 and Resolution TL-19145. *CRUISE* and Waymo can now operate taxi service, driving anywhere in the city at any time and charging for rides. The one vote against was by Genevieve Shiroma. One of the Commissioners who voted in favor is John Reynolds who was formerly general counsel at *CRUISE*. He had recused himself on earlier votes regarding *CRUISE*, but said "the passage of time allowed him to vote on today's resolution."

The City of San Francisco is not on board

The City of San Francisco filed motions to prevent the two Resolutions from taking effect. It claimed that "San Francisco will suffer serious harm if the AV companies are allowed expansion in the City with no limitations on geographic area, service hours and fleet size." Because the city had not sought to stop the companies for offering non-paid rides in 2020 and 2021, it will have some difficulty explaining why making the rides paid will do more damage that they are already doing.

Those who spoke against the Resolutions, including San Francisco government representatives, police and fire officials and residents, pointed to problems the vehicles had caused with first responders, all of the sudden and unplanned stops which snarled traffic, missteps in their compliance with traffic laws. They are the same issues being addressed by the U.S. DEPARTMENT OF TRANSPORTATION's *National Roadway Safety Strategy*.[22] There were concerns voiced over compliance with the *Americans with Disabilities Act* and with service accessibility. And there was also concern that with the increased level of telecommunications communications connectivity required for the vehicles to function properly, the wireless network is in danger getting overloaded.

Three of the four Commissioners were not swayed. The Resolutions were passed. Only a few days later, ten CRUISE vehicles blocked two narrow streets in the middle of the North

[22] https://www.dwt.com/insights/2022/11/usdot-national-roadway-safety-strategy

Beach bar and restaurant district. According to reports on the incident, the ten (Why 10 in one place?) sat there motionless with their blinkers flashing. CRUISE blamed the incident on humans, anti-driverless vehicle terrorists. Another week passed, and another problem occurred. A CRUISE vehicle parked itself in wet cement on a city street. Then another CRUISE vehicle carrying a passenger collided with a fire truck in a city intersection.

California's DIVISION OF MOTOR VEHICLES had heard enough. It informed CRUISE that it "immediately reduce its active fleet of operating vehicles by 50% until the investigation (of the incidents) is complete and CRUISE takes appropriate corrective actions to improve road safety". CRUISE complied. The DMV has not set a deadline for when its investigation will be complete, but said that it "reserves the right, following investigation of the facts, to suspend or revoke testing and/or deployment permits if there is determined to be an unreasonable risk to public safety".[23] The City is requesting that there should be a rehearing of the *CPUC*'s decision.

The Real Case for Driverless Mobility

Waymo seems to have done a better job with its proof of concept than has CRUISE, showing that driverless vehicles can operate in the tight confines of cities without causing havoc. Neither of them has addressed the real market for driverless vehicles, and neither have the State or City government officials in any of the markets where these and other companies are testing their so-called "robotaxis". In an upcoming book, I and co-author Alain L. Kornhauser make the case for driverless vehicles as follows:

- They are the best way to provide mobility to a large percentage of the population who cannot drive or who cannot afford to own a car and driver themselves. Taxis are too expensive and public transportation does not serve their needs to get where they need to go when they need to get there.
- Improved mobility for those who are unserved today means that more people can get to jobs, health care, educational opportunities and all the services that improve people's lives.

[23] https://www.autoweek.com/news/a44976703/gm-cruise-av-service-investigated-for-san-francisco-mishaps/

- Making good transportation affordable is better than using tax money to subsidize transportation solutions that do not meet the needs of a city's citizens.
- Driverless vehicle technology employs all of the sensing equipment that is making cars safer than they have ever been. Driverless vehicles are already well on the way to being ready to deliver safe rides within urban areas. With the proper guidelines in place for where, when, and how these cars can operate, they will become even safer.

Standards first, before the barndoor is opened

Before driverless vehicles are allowed on the roads, especially getting paid for delivering services, there should be internationally agreed standards. I made the case for this in the September-October 2023 issue of The Dispatcher. Without standards, whoever decides how the driverless vehicle algorithms work, whether it is the boss or the individual programmer, that person will use his or her own biases to determine what those algorithms do, and, further, when the deciding person is behind the wheel of a car that he or she is driving, they will take the same actions as the algorithms for which they were responsible. My proposition is that the task for any and all standards bodies developing the specifications for driverless vehicle algorithms is to make sure that all algorithms installed in driverless vehicles are programmed to do approximately the same thing, thereby eliminating to the greatest extent possible, individual biases.

Crew Comments

Views on standardization for driverless vehicles

AS A FOLLOW-UP to the article, I sent the following mail to all readers:

In the lead article in the September-October 2023 issue of THE DISPATCHER I put forward the hypothesis that without standards, whoever decides how the driverless vehicle algorithms work, whether it is the boss or the individual programmer, that person will use his or her own biases to determine what those algorithms do. For further support of this hypothesis, I offer the following:

> *"Ernie BOT has some controversial views on science. China's leading artificial intelligence (AI) chatbot, which was released to the public on August 31st, reckons that covid-19 originated among American vape users in July 2019; later that year the virus was spread to the Chinese city of Wuhan, via American lobsters. On matters of politics, by contrast, the chatbot is rather quiet. Ernie is confused by questions such as "Who is China's president?" and will tell you the name of Xi Jinping's mother, but not those of his siblings. It draws a blank if asked about the drawbacks of socialism. It often attempts to redirect sensitive conversations by saying: "Let's talk about something else."*
>
> *THE ECONOMIST SEPTEMBER 9TH 2023*
> *Business – Artificial intelligence; Meet Ernie*

I guess the vapers exhaled simultaneously in the Atlantic Ocean off the Maine Coast. Do you want another example? "The fun police made us take it out," said Elon Musk about NHTSA forcing Tesla to remove the code that allowed Tesla's FSD to roll through stop signs.

I will continue to work for developing standards for driverless vehicles.

Image courtesy of Reader One. It was produced by Sam Palmer and generated using Midjourney AI art.

READER ONE: "This (image) was generated by AI."

READER TWO: "Very good – and hilarious - examples! ☺"

READER THREE: "I have been pondering this standards question and am not certain where standards should apply. It seems like it going to be increasingly challenging for a 3rd party to jump in at the code level when the vehicle's behavior is trained on huge data sets and the creator can't explain what it would do.

"Perhaps, what needs to be measured is the output. Has anyone proposed a virtualized driver test that would be administered by a neutral 3rd party (e.g., IIHS, AAA, etc.)? This would be like the test that we took as a kid, but with millions of scenarios. To participate, one would have to

provide the raw driving data and the simulations that they use. The 3rd party would combine the raw driving data and simulations into one big test (e.g. so, a Cruise would have to test against its own as well as the data/simulation of Waymo's, Tesla, etc.). Of course, such a test regime would also have to apply and certify for the rules of each state.

"Regarding the bots and your last issue, you have probably seen this prescient episode of *The Office* where Michael relies on the turn-by-turn navigation bot, instead of using common sense."

Reader Four: "I agree with you 100%. If no standard is agreed the autonomous driver experience will be useless. I also would like to add smart road signs, instead of letting the car use its camera system to catch the signs it would be better, in my opinion, to let the road signs be smarter. They could catch both traffic- and weather conditions, plus historical data (AI), and guide drivers in the most secure and efficient way."

Views on Rudderless at NHTSA

Reader Five: "I really like the piece about NHTSA!"

Reader Six: "Your article on NHTSA was scary. I wonder how many other government agencies are similarly careening around bureaucratic corners."

Views on American cities losing their hearts

"There are those that look at things the way they are, and ask why? I dream of things that never were, and ask why not?"

—George Bernard Shaw

I am firmly in the first camp, although all of my architecture and urban planning training should have put me in the second. We were taught to look for solutions when confronted by a problem, whether the solutions were in our dreams or in our bag of experiences that we had seen in person or learned about through our books. Reproduce the Piazza San Marco wherever a central city refurbishment was asked for; separate walkers from cars and trucks like Le Corbusier when someone asked for a housing development; put everyone and everything in a central location at high density so that people could walk, bicycle or take transit to wherever they had to go if we hit the jackpot and a developer wanted

a new town. As I wrote in *American cities are losing their hearts*, for various reasons, Americans in both old and new cities are not showing a great deal of interest in living in high density urban areas, taking transit or visiting Piazza San Marco reproductions—unless they are in Las Vegases, Walt Disney Worlds, or in other countries.

A number of readers had their own thoughts based on their own experiences with city centers and downtowns, as well as what might be done to help them find a new life, and they agreed to share those thoughts with us.

David Hodge, filmmaker, artist, designer, and founder of Hodge Arts, Inc., has been a reader of *THE DISPATCHER* for over four years. He and his wife, filmmaker and media artist Hi-Jin Hodge, have dedicated their professional lives to putting the hearts back into cities.

"I've been reflecting on your poignant observations regarding the decline of the "heart" of our cities. It's undeniable that factors such as suburbanization, the rise of car culture, economic shifts away from urban centers, the impact of e-commerce, increased telecommuting, changing cultural values, certain urban planning decisions, safety concerns, and gentrification have collectively played a role in this urban transformation.

"However, while these challenges are significant, I believe there's room for optimism. There are strategies we can employ to rejuvenate city cores:

- Mixed-Use Development: By integrating residential, commercial, and recreational spaces, we can foster vibrant neighborhoods.
- Public Transportation: Upgrading and expanding our transit systems can draw people back into the heart of the city.
- Pedestrian Prioritization: Streets designed with pedestrians and cyclists in mind can revitalize urban spaces.
- Cultural Hubs: Investing in cultural and recreational centers can act as magnets for residents and tourists alike.
- Affordable Housing: Diverse housing options can encourage a more inclusive and lively community.
- Local Business Support: Championing local entrepreneurs offers unique experiences and strengthens city identities.

- Community Engagement: Involving residents in urban planning can drive a collective vision for the future.
- Green Spaces: Creating urban oases can significantly enhance city living. Safety Initiatives:
- Prioritizing safety can reshape perceptions and foster a welcoming environment.
- Adaptive Reuse: Repurposing historical buildings can merge the past with present needs.
- Business Incentives: Encouraging innovative businesses to set roots downtown can stimulate economic and social revival.

"Revitalizing our city centers is a multifaceted task, shaped by many challenges. It's the orchestration of all these strategies, rather than any singular one, that will herald change. This painstaking process gives me hope, and I am confident that the next generation's fresh perspectives will foster an urban renaissance.

"I look forward to talking further with you on this topic. This is central to our "Where We Live" project, including several documentary films and artistic work, "Voices of the City." Additionally, it's the crux of our latest VLOG endeavor. Your insights would be valuable as we delve deeper into these explorations. Here is the link to the project site: https://www.newstory.space/filmseries."

Rich Grady is the retired President of APPLIED GEOGRAPHICS, INC. in Boston, MA, and worked with me at ESSELTE MAP SERVICE USA.

"I think the observations you make are valid. As someone who no longer needs to go to downtown Boston for work anymore, I rarely go there for any reason. I think that is generally true for a lot of people who live outside the city. If there is no sense of community in a place, there is less to attract visits. While sport and concert venues might occasionally attract visits, time-on-the-ground is typically limited to the event itself, unless you are vacationing and staying in the city. And as you point out, venues and events are popping up in towns and villages outside of the big city, fulfilling a demand for such things without necessitating inconvenient travel.

"You also mention that this has been the trend for many decades, which I've also observed, albeit with the intermittent

attempts to reverse the trend by city planners with a variety of measures to make the old CBDs more attractive. The pandemic certainly changed travel patterns, and also spawned some village-like measures to make urban spaces more pedestrian and bicycle friendly. Cities continue to evolve, and an enduring challenge in my mind is that of invigorating a sense of community that attracts people and makes them want to spend time (and money) downtown, and maybe even live there. Thanks for stimulating my thoughts on this subject!

Barry Siegel is an educator, lecturer and provider of document translation services living in Strängnäs, Sweden.

"I can only comment on what I have seen in Sweden since I am not in the U.S. often enough to see what is actually happening there. However, I have no doubt that what you are saying is happening. It is certainly happening in Sweden. It only makes sense that the "managers" of cities and towns have to adjust to the massive changes that are occurring in their worlds, especially in regard to the replacement of traditional methods of socializing, commuting (apropos transportation systems constructed to serve purposes that are slowly disappearing), consuming, etc.

"The digitalizing of the world is taking us into a world in which many of the ways we are used to living our lives have been, and are continuing to be affected, forever. We have already traveled beyond the cusp of the paradigm shift. It is already here, only the hangover of wishing things could be as they were before remains (for some). The generation born before the digital revolution has issues (as you mentioned, refused to accept these changes), but they will soon be returning to Mother Earth and the changes you mention that are needed will come about.

Russell Swanson is an architect and Princeton Township Planning Board member.

"I found the Musings extremely enjoyable reading. There are two things I want to comment on:

1. You state that "city centers once were destinations, they aren't anymore." That may be too general. Manhattan is obviously a destination. Even a city that had been in decline like Cleveland has a central destination for office workers

and enough retail and cultural attractions to lure visitors in. The automobile stymied growth of central cores in large cities but there is still a destination point of some size there. I think it's the small and midsize cities that were most likely to lose their destination center. These cities were not large enough to develop a strong core so when automobiles supplanted buses and trains, there was no incentive for businesses and residents to remain or move to a central location.

2. Moving bus service from a hub-and-spoke pattern to one that also incorporates point-to-point is really important. I think Mercer County's bus service is primarily a hub-and-spoke pattern centered on the Trenton train station and every time I see one of the buses with two or three passengers go by, I think there has got to be a better way.

Gene Mahalko is a retired University of North Dakota computer science professor, Scranton native (we were classmates in high school), and long-time resident of Salt Lake City, Utah. He lives in the center of the city.

"Downtown SLC is I think a hopeful aberration. The downtown seems pretty vibrant. A second "downtown" seems to be forming about 18 miles away at the south end of the valley, in Sandy, UT. That actually seems like a fairly reasonable, organic development. Utah County, to the south, is kind of weird. There is no real downtown in any of the cities there. It's all strip mall. The closest might be a huge set of office complexes at Thanksgiving Point, just south of the SL County line and "Point of the Mountain", where the very tail end of the Uintah Mountains (an unusual east-west oriented range), which nearly cuts off the two valleys.

The Latter Day Saints church put up a $1.5 billion mall and series of office buildings and high rise condos (City Creek Centre, about 20 acres downtown) directly south of Temple Square. They have a huge vested interest in keeping downtown alive and not letting it get run down. Between that and three light rail lines that go through or closely skirts downtown, they have kept the downtown hopping.

Musings of a Dispatcher: Power Delusions

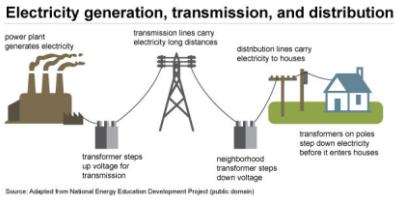
THE DISPATCHER

Mobility Industry Insights by
Michael L. Sena
November-December 2023
Volume 11, Issue 2

Electricity comes from wires, right?

THE FIRST LESSON we learn in economics is this: Money doesn't grow on trees. Every child in the neighborhood where I grew up was taught this lesson as soon as they understood that it took money to buy things. You had four choices if you wanted to have something, like a new baseball glove. You could earn the money by working for it, save what you earned, and buy what you wanted; you could steal the money; you could steal whatever it was that you wanted to have; or you could hope your parents would give it to you as a Christmas or birthday present. A few kids in my neighborhood chose the second and third options, and paid the price, but most of us either chose the first, waited for the fourth, or decided we could manage without. An allowance? No one I knew had one. We got milk money every day, which might also buy a stick of licorice.

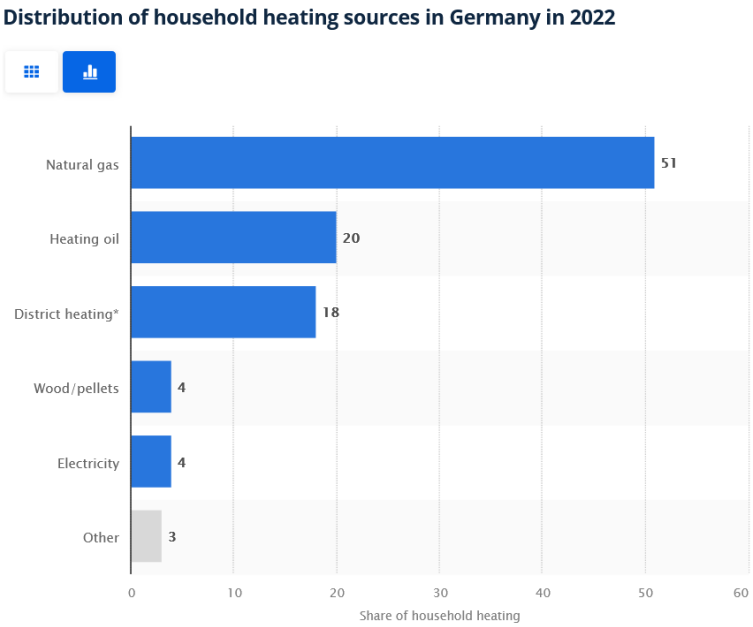
I haven't seen a survey which asks people where they believe electricity comes from, but I'd bet that most would answer that it comes from wires. However, I would expect that people who have been elected or appointed to positions of authority with responsibility for energy policy would know the correct answer to that question. According to the U.S. ENERGY INFORMATION ADMINISTRATION, electricity is generated with diverse sources and technologies.[24] The three major categories of energy for electricity generation are: 1) fossil fuels (coal, natural gas, petroleum, and if you have enough of them, trees); 2) nuclear energy; and 3) renewable sources (wind, solar, water, geothermal). Once electricity is generated, it is delivered via substations, transformers and power lines (called the *grid*) to points of consumption. (See diagram in the sidebar.) It comes through wires, but it does not come from wires.



[24] https://www.eia.gov/energyexplained/electricity/electricity-in-the-us.php

Robert Habeck, who is the co-leader of the German Green Party, which together with the Social Democrats and the Free Democratic Party have formed the government of Germany since December 2021, is the person in charge of energy policy for the Germany. Not only that, Olof Scholz, leader of the Social Democrats and Chancellor of Germany, appointed him Minister for Economic Affairs and Climate Action as well as Vice Chancellor. He is one of the most powerful politicians in Europe. Not bad for a writer of children's books with a Ph.D. in philosophy that he earned in 2000 at the age of thirty-one. He has never worked in business nor with anything remotely resembling electricity generation in his fifty-four years. He entered politics in 2009, and, apparently, it's been a good gig.

It seems that Herr Habeck believes that money grows on trees and that electricity comes from wires. In the spring of 2022, after Russia invaded Ukraine, he submitted a bill to the Bundestag, Germany's parliament that would mandate replacing all gas and oil boilers with heat pumps starting in 2023. As the graph to the right shows, for heating their homes, 51% of Germans use natural gas, 20% use heating oil, 18% use district heating, and 4% use wood and pellets (compressed sawdust). A puny 4% using electricity. The 3% 'other' could well be coal. That means that 93-96% of Germans use fossil fuels for heating their homes, not 80% as reported in *THE ECONOMIST SEPTEMBER 23RD 2023* article that inspired this *Musings*.



Heat Pump Basics[25]

A heat pump is part of a home heating and cooling system and is installed outside your home. Like an air conditioner with central air, it can cool your home, but it is also capable of providing heat. It runs on electricity. Despite the name, heat pumps do not generate heat. They move heat from one place to another. A furnace creates heat from fuel that is

25 https://www.carrier.com/residential/en/us/products/heat-pumps/what-is-a-heat-pump-how-does-it-work/

distributed throughout a home, but a heat pump absorbs heat energy from the outside air (even in cold temperatures) and transfers it to the indoor air. Heat pumps are more common in milder climates, where the temperature does not typically drop below freezing. A typical air source heat pump system consists of two major components, an outdoor unit (which looks just like the outdoor unit of a split-system air conditioning system) and an indoor air handler unit. Both the indoor and outdoor unit contain various important sub-components. The outdoor unit contains a coil and a fan. The coil operates as either a condenser (in cooling mode) or an evaporator (in heating mode). The fan blows outside air over the coil to facilitate the heat exchange. Like the outdoor unit, the indoor unit, commonly referred to as the air handler unit, contains a coil and a fan. The coil acts as an evaporator (in cooling mode) or a condenser (in heating mode). The fan is responsible for moving air across the coil and throughout the ducts in the home.

Installing a heat pump can be a complex task, requiring a thorough understanding of HVAC systems and electrical connections. An expert is needed to ensure a seamless and efficient installation, from assessing the specific heating and cooling requirements of a space to correctly sizing and positioning the heat pump, planning and executing the installation, considering factors such as ductwork, electrical compatibility, and optimal placement.

The cost of purchasing a heat pump and installing it in a home is between €20,000 and €30,000, depending on the size of the home and whether there is existing ductwork (e.g., for whole-house air conditioning or forced air heating).

The outside equipment for a typical residential heat pump.

You don't just turn off the boiler and turn on the heat pump

There are approximately 17 million households in Germany living in single-family houses. Another 22 million households live in rented dwellings. The cost of converting 93-96% of the 17 million homes from whatever fossil fuel is being used to heat them today to a heat pump system will cost in the vicinity to €500 billion, give or take €100 billion. (Note: The 2021 federal budget for Germany was €369.3 billion.) The cost of converting the apartment buildings will be at least that much, but most probably more. Every home and apartment building is a unique construction project which will require the installation of equipment inside and outside the home, and the building of ductwork to distribute the heat to all the rooms in the home. Then there are all the offices, schools, hospitals, churches, fire houses, sports halls, pigeon coops, etc. Did Bobby really think this through? Have the more than half of the Bundestag members who voted in favor of this proposal truly considered the consequences for

building owners, and especially the budget (if the government is thinking about subsidizing this party), and for the impact on the construction industry? Habeck's proposal passed this September by 397 to 275.

How we heat our homes has changed with the times

Germany, along with other countries in Europe and the places to where Europeans emigrated, used different methods to heat the buildings where they lived and worked, and we are living with the legacies of those methods to this day. Perhaps Robert Habeck, because of his relatively young age (54) does not have any recollection of the most recent conversion from coal to gas that took place in the 1960s and early 1970s, or maybe he just chooses to ignore historical facts. It could be that the relatively young members of the Bundestag are also unable or unwilling to connect the current situation to past acts. The average age of the 736 members of the Bundestag is 47.3 years, 45.5 for the women and 48.2 for the men. Fifty members are under 30. The Greens, the party to which Dr. Habeck owes his allegiance, have an average age of 42.4. Just by way of contrast, the average age of U.S. Senators is 63.9, and for House members it is 58.3. Fully 50% of U.S. Senators are 65 or older. This does not mean that the U.S. Congress is going to make better decisions—we have seen that they have trouble just keeping the country running and choosing their leaders—but it does mean that it will have enough members who appreciate how we got to where we are, and are not just a bunch of Boomer bashers.

For thousands of years, we humans have warmed ourselves up by making fires, fueled mostly by wood, but also other burnable matter like dried peat and dried animal manure. In a 2015 study by the *U.N. Intergovernmental Panel on Climate Change*, it was estimated that 2.8 billion people in the world are still using wood for heating their dwellings and cooking their food.[26] The U.S. inherited two traditions from their principal early immigrant groups. The British brought their fireplaces, and the Germans brought their cast iron stoves. The iron stoves (often called "potbellies") were more practical and could more easily be spread around a house or factory than stationary fireplaces, and with fireplaces, most

[26] https://www.climatecentral.org/news/study-downgrades-climate-impact-of-wood-burning-18560

of the heat goes up the flue and out the chimney. Stoves were also more adaptable to coal when it began to be mined in the beginning-to-middle of the 19th century.

Swedish Tiled Stoves

*For some reason, the Swedish tiled stoves (*kakelugnar*) never made it across the Atlantic to North America. A traditional Swedish tiled stove has five flue ducts with a length of about 10 meters. The smoke from the fire box first rises in the middle duct, then down through the two front side ducts, turning upward through the two rear-side ducts, after which the smoke passes through the damper in the rear upper part of the tile stove and continues out to the chimney. When the flue gases pass through the duct system, they give off heat to the stove structure. The flue gases are cooled and the tiled stove is heated. The large magazine accumulates the heat and slowly releases it to the environment long after the fire has gone out.*

We purchased the tile pieces of a kakelung *in 1986 in Stockholm with the intention of installing it in the home we built outside of Boston, but we moved to Sweden before we shipped it over. It remains in storage in pieces in several boxes.*

Fire burn and caldron bubble

Central heating with coal-burning furnaces was the major breakthrough in heating. This came in the mid-1800s, first in institutional buildings and then in homes. They were often referred to as "boilers" because the coal fire would heat water that turned into steam. In the early systems, steam circulated in iron pipes to stand-up cast iron radiators that transferred heat to the surrounding area by convection, not radiation, so they really should have been called 'convectors'. Cold air in the radiator was pushed out through a vent and displaced by the steam. Condensed steam flowed back to the boiler in the same pipe that delivered the steam.

The house in which I lived during the first thirteen years of my life, which was built in the 1920s, had a steam boiler and single pipe cast iron radiators. The furnace was fed coal by hand (my job when I was old enough to do it), shoveled in from the basement coal bin. That bin contained chestnut-sized anthracite coal and was filled on a regular basis by the coal man who connected chutes from his truck that passed through a special coal door in the basement wall. Ashes from the burnt coal were put into ash cans which were picked up by the ash trucks that operated on a separate schedule from the garbage trucks. In that house, there was a combination coal and gas stove and oven in the kitchen. The gas came from the Scranton Gas Works, which was generated by burning coal. (The flames from the coal being dumped into the furnace were visible from my bedroom window.) The refrigerator, washing machine, radio, tv, and lights ran on

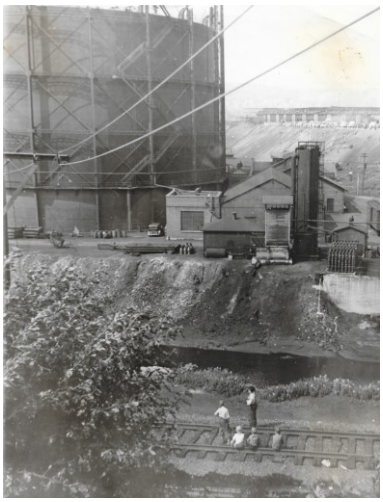
The coal men make sure that not a single nugget of coal spills out of the coal chute on its way to the cellar coal bin.

electricity that was generated from the burning of coal by the Scranton Electric Company. Steam that was created during the electricity generation process was used in the downtown area to heat all the buildings. The steam ran in pipes under the sidewalks with the side benefit of melting snow that fell on all central city's sidewalks.

Our family moved to a five-year-old house in 1960. The house had a coal-fired furnace of the new so-called 'stoker' design. A screw mechanism moved pea-sized coal from the coal bin into the fire box. There was no manual shoveling and much less ash due to the higher temperature of the burning and smaller surface area of the coal. Instead of steam, hot water was circulated in much smaller diameter copper pipes to a combination of baseboard and stand-up aluminum fin radiators.

The big switch from coal to natural gas, nuclear and renewables

By the end of the 1960s, coal had outlived its usefulness as a major source of wealth. Oil was the new black gold. Natural gas pipelines were being built all over North America following the discovery of massive oil and gas fields in the Southwest U.S. The Natural Gas Act of 1938 gave the federal government oversight of transportation and sale of natural gas. Natural gas finds in the North Sea in the 1960s meant that Europe also had a substitute for coal-generated gas.



The concentric rings of the Scranton Gas Works gas holder rose when newly produced gas was pushed into it, and fell when the gas was pushed out into the gas mains for distribution to homes and other facilities.

Within a decade, residential coal furnaces were replaced by gas and oil. My parents replaced their coal stoker with a gas furnace without needing to touch anything else in the heating system. All that was needed was a connection from the gas main. The Gas Works was closed. Instead of coal-generated gas being pushed into the mains from the gas holder (see sidebar right), natural gas filled the gas mains from the pipelines. Some of our neighbors chose heating oil systems and installed an oil tank where the coal bin had been.

Something else was also happening: nuclear energy. After World War II, research on nuclear fission expanded beyond bombs to peaceful and more practical uses of the technology. In 1957, the U.S. ATOMIC ENERGY COMMISSION started up the first nuclear power reactor in Shippingport, PA which operated until 1982 although it was meant to be only a demonstration of the pressurized water reactor (PWR) design. The UK, Canada, France, USSR, and Sweden led the way. For

various reasons, nuclear energy as a source for generating electricity or producing heated water for community-wide heating systems stalled in some countries and never got started in many others. Today, 20% of America's electricity is generated with nuclear energy, while in France the share is fully 70%. In spite of the fact that nuclear energy, which emits no greenhouse gases, offered a brilliant alternative to fossil fuels as an energy source, anti-nuclear forces, who objected to the idea of using the same source of energy that makes atom bombs, limited its use, and, in the case of some countries, notably Germany, have banned its use altogether.

During the chancellorship of Gerhard Schröder,[27] between 1998 and 2005, the Social Democratic-Green government decreed Germany's total retreat from using nuclear power by 2022. This phase-out plan was initially delayed in late 2010, when, during the chancellorship of center-right Angela Merkel, the coalition conservative-liberal government decreed a 12-year delay of the schedule. However, after the March 2011 Fukushima accident and subsequent anti-nuclear protests, the government announced that it would close all of its nuclear power plants as planned by 2022. Eight of the seventeen operating reactors in Germany were permanently shut down following Fukushima. Nuclear power accounted for 13.3% of German electricity supply in 2021, supplied by six power plants. Three of these were switched off at the end of 2021, and the other three ceased operations by April 2023.

How the Greens Grew[28]

"Green Party of Germany, Die Grünen*, traces its origins to the student protest movement of the 1960s, the environmentalist movement of the 1970s, and the peace movement of the early 1980s. The principal focus of the protests was nuclear power, and the movement was directed especially at German labour, businesses, and politicians, all of whom enthusiastically endorsed the use of nuclear, particularly after the sharp rise in oil prices in 1973. Plans were approved in the late 1970s to build a series of nuclear power plants that would supply much of Germany's*

[27] Gerhard Schröder went to work for Russia, Inc. within days after leaving losing his post as Chancellor in 2005. He became a member of the Nord Stream board of directors. Nordstream is majority-owned by Russia. In 2004, he referred to Vladimir Putin as a "flawless democrat". He was named to the position of Chairman of the Board for Rosneft, Russia's largest oil company. He was stripped of his privileges as a former Chancellor by the German Bundestag.

[28] https://www.britannica.com/topic/Green-Party-of-Germany

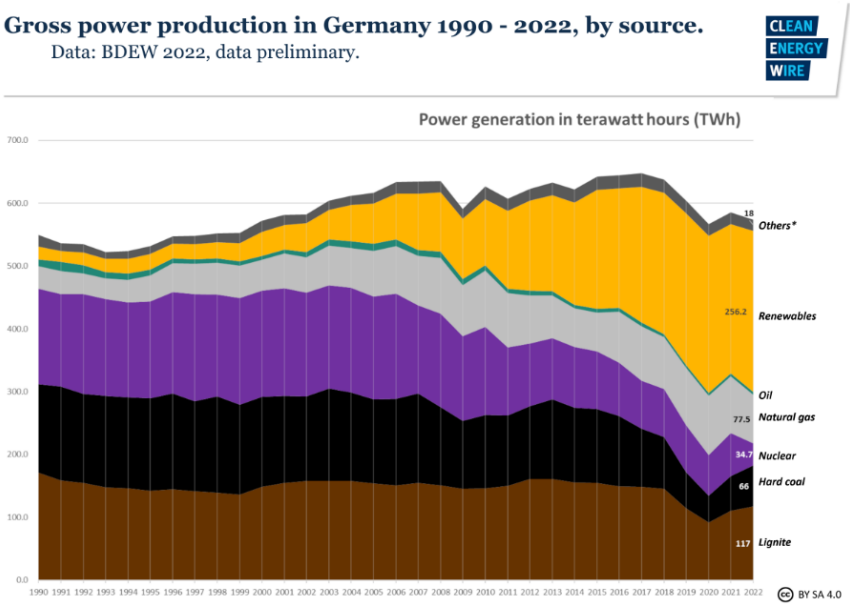
energy needs. In January 1980, the Greens held a conference in Karlsruhe, where it officially formed itself as a federal party. Widespread opposition to the deployment of a new generation of nuclear missiles in West Germany sparked a nationwide peace movement that helped the Greens enter the national parliament in 1983 with 5.6% of the vote. In the aftermath of the Chernobyl nuclear accident in the Soviet Union, the Greens captured 8.3% of the vote in 1987. The party declared that it was committed to nonviolence, the withdrawal of Germany from the North Atlantic Treaty Organization (NATO), and unilateral disarmament (which explains why, in large part, Germany had trouble meeting its 2% commitment to NATO). Nevertheless, the Greens supported participation of German military forces in Kosovo and Serbia in 1999, and troop deployments in Afghanistan as part of the global war on terrorism in 2001. For many party members these two exceptions were flagrant violations of the party's most precious values: nonviolence and the rejection of military force as a solution to political problems. It has not waivered on nuclear energy.

Once coal was relegated to the minor leagues for heating and electricity generation, every country, and regions within countries, attempted to pilot their energy policy ships on the ever-changing geopolitical waters on which currents were constantly shifting. To make their lives more complicated, climate consciousness was awakening. The first World Climate Conference took place in 1979. The *INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE* (*IPCC*) was established in 1988, and two years later it called for a global treaty on climate change. The first Conference of the Parties (COP 1) took place in Berlin in 1995. The *Kyoto Protocol* of 1997 legally bound signature countries to emission reduction targets. It was primarily Europe that accepted the Protocol's commitments. The U.S. signed the Treaty, but it was never ratified, and China and India, along with 100 other companies were exempted because they were designated "developing".

So, on the one side, western countries were voluntarily saddling themselves with emissions reduction targets with definitive performance timelines, and on the other side, each of these countries was attempting to establish an energy policy for heating homes and generating electricity that was affordable, practically implementable, and acceptable to the majority of its citizens. This was—and remains—an extremely difficult balancing act, especially in Germany, which, with quite a lot of help from Gerhard Schröder and the Greens, placed itself at the mercy of Russian gas and oil. It does not have an appreciable amount of water storage capacity for

hydroelectric power generation, has a relatively cold climate, remains heavily dependent on coal, especially lignite, the dirty variety, and has shut down its nuclear energy facilities which, in 1990, generated almost 30% of the country's total energy needs.

As the chart below shows, renewables are more than half of the energy sources for power production in Germany. If wind and solar keep growing as coal, nuclear and gas are phased out, and if all buildings have to switch to electric heating, there is a very big chance that not only will all the lights go out the next time a volcano blows off in Iceland, but if it's a cold winter, everyone will freeze.

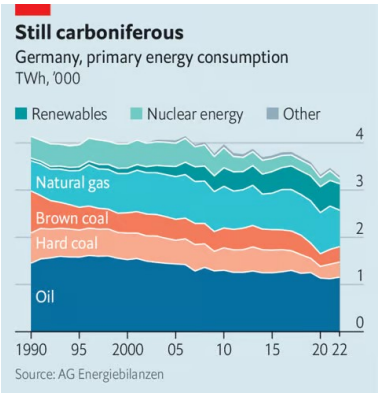


There's a good reason for the saying about eggs and baskets

Germany can't seem to resist putting all of its eggs into a single basket. It has gone from being completely dependent on coal to having over 50% of its homes heated by gas and another 20% by oil. It has not escaped notice that Gerhard Schröder piloted the German energy ship right into Russia's oil and gas harbor, and the Greens pulled the plug on the most dependable option to fossil fuels. Now, it wants everyone to use electricity to heat their homes and all other indoor facilities—as well power their vehicles—but it has not secured its electricity production in a way that will ensure that if the wind doesn't blow or the sun doesn't shine, its folks are not going to freeze to death in the winter. It must, therefore, for the most practical reasons, keep its fossil fire capacity burning.

Germany is not alone. Other countries that have had solid, multi-basket energy policies, have gone off track. Sweden is one of those countries. In a moment of weakness, its largest party, the Social Democrats, agreed to a timeline for closing its significant nuclear power generators. One of its coalition party members proposed that it would be much safer to burn trees, of which Sweden has plenty, than to worry about a nuclear meltdown. Sweden's current government is back-tracking on the nuclear closedown commitment, and it appears that all of the parties have agreed to open the door to new nuclear power. Reality hit the fan.

At the close of *THE ECONOMIST* article referred to earlier, German economist Hans-Werner Sinn said that *"in Germany's current primary-energy mix, including fuel for transport and heating as well as electricity generation, the share of renewables still remains below 20%. Given that Germany abandoned nuclear energy earlier this year, making the remaining 80% clean would mean covering 2% of Germany's surface area (with wind turbines and solar panels), as much as its entire transport network."*



From THE ECONOMIST SEPTEMBER 23RD 2023 article: Energy-wander – Angst mounts over Germany's green transition

The article closes with a reflection: "Maybe Germany should have invested in more nuclear power instead." Of course! Everyone sees that except the revolutionary party, the Greens, who had only one purpose at the start: to STOP nuclear power at all costs. Now that it has done that (at least in Germany), it has, once again, only one purpose: to STOP all greenhouse gas emissions from emanating from inside the BUNDESREPUBLIK DEUTSCHLAND at all costs, and damn everything else.

There is a lot to be said for evolution, rather than revolution

Robert Habeck and his green colleagues in Germany has managed to shift his country into crisis mode and declared a state of revolution. According to them, every other issue pales in comparison to the absolute necessity to first stop and then reverse global warming. Humans have witnessed many revolutions. Edmund Burke, a member of the British parliament for almost thirty years with the Whig Party between 1766 and 1794, was critical of the French Revolution for "destroying the fabric of good society and traditional institutions of state and society". He pointed out in his 1790 pamphlet, Reflections on the Revolution in France, that by

demanding the "rights of man", liberty, equality and fraternity (the last being a commitment to the common cause of the first two), the French revolutionaries declared an absolute goal which they pursued to the exclusion of all other goals. Burke became regarded as the philosophical founder of Conservatism, the political philosophy that seeks to promote and to preserve traditional institutions, customs, and values.[29]

C.W. Parkin writing about Burke in the book Political Ideas,[30] formulated Burke's thinking on the subject of the French Revolution: *"Liberty is good, but so are other things, like justice, order, and peace; they are even indispensable to the reality of liberty itself. Above all, social progress lies in an extension of values already embodied in the life of a society, rather than in some distant goal whose realization demands the suspension or hazard of things which are actually enjoyed; not in the sacrifice of the real present for the hypothetical future. The aim cannot be some absolute or final perfection of society, but the greatest practicable perfection; and this requires not only a zeal for reform, but a sense of the possible. And the pace of society's life must be respected, if continuity are to be preserved, and a durable advance secured."*

Burke was writing in 1790, and Parkin in 1966. There were many revolutions that occurred before the one in France, and there have been many afterward. Burke used his knowledge of those which preceded events in France to predict its eventual outcome: chaos, suffering, the rise of a dictator (Napoleon), and the return of the monarchy. His reflections were prescient viewed from the perspective of Parkin in 1966 and our own in 2023. Parkin suggested that we view Burke's positions not as Conservative, but as "a complete, balanced system of politics, of morality, of man, in its own right."

Planet Earth doesn't need a revolution or revolutionaries; it does not need Cassandras; it needs a complete, balanced system of politics, of morality, of humans, in our own right, to keep the Planet habitable—enjoyably livable—for those of us living here now, and for those who will come after us.

[29] https://en.wikipedia.org/wiki/Conservatism

[30] Thomson, David (Editor). Political Ideas. First published by C.A. Watts & Co., Ltd (1966). Published in Pelican Books (1969).

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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