

**ORION**

# **Strategic Intelligence Report**

My ORION Project

Your personal strategic intelligence workspace - select forces from the ORION Global Dataset

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# Executive Summary

This report provides a comprehensive analysis of the selected strategic driving forces. These forces represent critical uncertainties and trends that may impact the strategic landscape. The following sections detail each force, its dimensions, and potential implications.

# Driving Forces

## 1. First there was Netflix. Now you can subscribe to an electric car

Type: Weak Signal

You've already got a monthly Netflix subscription, and maybe a veg box delivery service. So why wouldn't you start leasing an electric car on the same month-to-month terms? Hot on the heels of bicycle and other monthly subscription services, drivers can now get electric cars on a renewable monthly basis, with everything included – even free charging. A number of firms are now offering this fresh take on driving, effectively giving people a chance to try electric vehicles without the commitment of buying or entering a lengthy leasing agreement. For £389 a month – with no up front deposit – Onto will provide a Renault Zoe 135 capable of about 190 miles on a full charge. As with Netflix, the contract automatically renews each month unless you cancel, meaning that as long as you keep paying, the car stays outside your house. Included in the monthly fee is the insurance, maintenance and servicing, tyres, breakdown cover, the London congestion charge registration – and charging at 11,000 public chargers. Analysts say it is a great way to try an electric car without a huge financial commitment. Until now, the options were expensive leasing deals, typically lasting a minimum of two years, starting at around £240 a month. Usually, there's a deposit of three monthly payments upfront, and drivers have to insure and service the car themselves. Those buying a new electric car faced having to hand over a minimum of £25,000. By the end of this month Onto expects to have a fleet of 2,300 vehicles and is planning to double in size every three months throughout 2021. Its service is based on its smartphone app. Customers have to be aged 25-85 and have to have a driver's licence with no more than six penalty points in the last three years. You also can't have been the cause of more than one crash in the last three years. However, if you qualify and can pass the firm's ID and other checks, it will deliver a car to your home (for £49.50) within 72 hours. There are a range of models on offer – from the Zoe starting at £389 a month, up to the luxury Jaguar I-Pace at £1,299 a month. The Tesla Model 3 starts at £799 a month for the standard car, while the long-range version, with a 280-mile range on a full charge, is £999 a month. The crucial difference between these prices and conventional leases is that they include access to Onto's fleet insurance policy. Users are allowed to use the car for commuting, social use and occasional business. However, commercial use, as a taxi or similar, is prohibited. When you consider it could easily cost £800-£1,000 a year for many drivers to insure these cars, Onto's pricing starts to look like good value. If you want a partner or friend to be able to drive, you'll pay an extra £9.99 a month. Be warned, though, that if you have an accident you will have to pay the first £1,000 of any claim. Hirers get 1,000 miles included in their monthly fee, but you can buy extra if you find your mileage starts adding up. Rather bizarrely, you don't get the actual car keys: you will only be able to use the app on your phone to unlock, lock, and start the car. The best bit is that if you decide you don't need the car, after three months for instance, you can hand it back with no financial penalty other than the £49.50 collection fee. Equally you can trade up or down to a better car, or a cheaper model, at any time. All the firm's cars are 100% electric. Free charging comes via BP Pulse, Shell and Tesla's network, which would normally cost 30p per kWh, or around £15 to fully charge a Zoe. There is, of course, nothing to stop you charging the car at home at your own expense. The other main difference between this service and a conventional lease is that you don't get a new car: but it will generally have low mileage and be less than two years old. Rob Jolly, Onto's founder and chief executive says: "Onto was set up to make the customer shift to electric cars accessible, easy and affordable. "Our subscription service means customers can sign up for a monthly rolling contract knowing that all their costs will be included and that they can continue, switch models or stop at the end of each month.

“Ultimately, we want to remove the barriers to EV adoption and encourage more zero-emission cars on to the roads. We also don’t believe flexibility should come at a premium, so our subscriptions are competitive with leasing – but with everything included.” Rival firm Elmo works in a similar way, although its terms are not quite as favourable. Users have to agree to a minimum three-month rental, at which point they can cancel with 30 days’ notice. Drivers also have to be at least 30 to qualify, charging access costs an extra £10 a month, and you only get 800 miles a month included. It’s offering a basic Nissan Leaf for £330 a month plus £95 admin fee, although the Renault Zoe at £379, plus fee, looks a better bet. It also offers the MG ZS from £429 a month. These have much more space than the Zoe and would a good choice for anyone needing a standard family-sized car. Melanie Shufflebotham, the co-founder of the Zap-Map website and app, which lists the country’s EV charging points, says these services are a great way to try an electric car, without tying yourself into a long and expensive contract. She said: “Many people are keen to go electric but have concerns about the cost, or making a leap into the unknown. Studies shows that when drivers make the move to electric, they are unlikely to go back to a petrol or diesel car, so this could be a real game-change in shifting the dial on electric vehicle uptake.”

*Source: The Guardian*

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## 2. Autonomous robots eye caregiving

### Type: Trend

The US healthcare industry faces a critical staffing shortage amid a rapidly aging population. Projected shortages of over 139,000 physicians and 63,000 nurses by 2030. Ages 65+ Healthcare leaders look to advanced robotics for solutions. Categories in focus include caregiving support, hospital operations and logistics, lab automation, and remote care delivery. Highly capable humanoid robot developers eye caregiving applications. Scouting Report • Core Products/Services: Develops and manufactures humanoid robots equipped with AI for various industries. Primary product is Neo, a second-generation android designed for home assistance and consumer tasks....Robots feature human-like movements and behaviors, capable of learning and improving task performance over time. The company’s “master plan” highlights a long-term business opportunity: " 700M aging population in need of at-home care " Tesla Optimus Robot "What can it do? It can basically do anything you want. It can be a teacher, babysit your kids, it can walk your dog, mow your lawn, get the groceries, just be your friend, serve drinks." Riding wave of market interest, autonomous robots have healthcare in view. Healthcare leaders should explore partnerships and pilots now to prepare for next 10 years.

*Source: CB Insights*

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## 3. Auto subscription from coffee company

### Type: Trend

The German retailer Tchibo has partnered with like2drive to offer electric vehicle subscriptions. Customers can visit the Tchibo online shop and choose between a Tesla Model 3 and a Fiat 500E ICON. In contrast to conventional leasing models, the customers save on the starting premium, factory transport and final instalment. For a monthly flat-rate fee amounting to €777 for a Tesla Model 3, the customer gets 10,000 included kilometres a year. The cost for insurance, taxes, repairs, maintenance and winter tyre changes are included in the price. According to Tchibo, this offer will allow more people to switch to electric vehicles.

*Source: TrendOne*

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## 4. Mobile entertainment hubs

### Type: Trend

Vehicles today are jam-packed with entertainment options for passengers and, in some instances, even drivers. Vehicles are rolling out to market with immersive audio, larger screens, and the ability to stream movies, shows, and play video games. Broadcast TV in vehicles is in the works thanks to a coalition of players across mobility and media, and the UK government has given its blessing for drivers to watch TV in an autonomous vehicle operating in self-driving mode. Partnerships will continue to play a key role in bringing more entertainment into the automotive space. One prime example is the new partnership between Honda and Sony, under the joint EV brand Afeela. Honda will be focusing on the automotive build, while Sony will bring its expertise in entertainment, screens, image sensors, and virtual reality. The future of entertainment in the vehicle cabin is potentially limitless, as EVs offer much more flexibility in their design because of where the batteries and motor(s) are located. The promise of an autonomous vehicle future also has some companies, like Apple, drawing up wild plans, such as patents for windowless vehicles that rely on entertainment systems and mixed reality headsets. However, mixed reality is available today, as retrofitting kits for VR tech for backseat passengers can be installed, using products from Holoride. With increased entertainment options, some fear that traditional radio, especially AM in the US, will be eliminated. The National Association of Broadcasters notes that Audi, Porsche, Tesla, Volvo, and VW have already removed AM radio from some or all of their electric vehicles. Ford has also announced that the F-150 Lightning will eliminate AM radio in future iterations. Loud noises and hums from electromagnetic interference interfere with AM radio in EVs, but it is more likely that the plethora of entertainment options is what will really drown out the radio.

*Source: Future Today Institute*

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## 5. Is Silicon Valley's golden era coming to an end?

### Type: Weak Signal

Huge layoffs at Snapchat, dramatic valuation drops at Meta and Apple, and hiring freezes at other Big Tech firms have given new fuel to an increasingly common question: Is Silicon Valley's golden era coming to an end? The answer is complicated, experts say. The tech industry has been on a run of impressive growth for some time, bolstered in recent years by a pandemic that forced most of the world online and sent demand for tech services booming. That explosion – and the high salaries and office perks that came with it – seems to be slowing. This party couldn't go on for ever Margaret O'Mara, University of Washington professor and author "This party couldn't go on for ever," said Margaret O'Mara, professor at the University of Washington and author of *The Code: Silicon Valley and the Remaking of America*. "In many ways, we are just going back to normal after a huge run up during which everything became supersized." Those trends are exacerbated by a larger global downturn – one the tech world is not immune to, she added. The Federal Reserve has raised interest rates three times already in 2022, and more increases are expected. The previous low-interest-rate environment had bolstered the tech boom, helping to create a parade of "unicorns" – companies whose valuations exceed \$1bn. Notable examples include Airbnb and Uber – valued at \$47bn and \$82bn at their respective public offerings. But as interest rates shift, O'Mara said, there is "less money sloshing around" and investors are going to be deploying cash "in a much more judicious fashion". "Certain investors will still have cash, but during a bust like this the deal flow is going to be cooling," she said. Fast growth has also been tempered by a series of high-profile cautionary tales, from the decline of WeWork to the collapse of Theranos, the blood testing firm that rose to popularity in an environment of glowing press, ultimately amassing a valuation of more than \$1bn before it was found that its claims were untrue. Such stories, coupled with more scrutiny on the tech industry at large over the past decade – including whistleblower revelations against Facebook and public

grillings of tech executives in Congress – are shaking Silicon Valley's image. Even some of its most vocal champions, including former president Barack Obama, seem to have reconsidered. Obama used Facebook extensively in his 2008 campaign and praised the company in his 2011 State of the Union address, only to condemn its role in the spread of disinformation, particularly around elections, in a recent talk at Stanford University. "One of the biggest reasons for the weakening of democracy is the profound change that's taken place in how we communicate and consume information," Obama said. Lawmakers and US federal agencies have now jumped into the fray. With growing action from the Federal Trade Commission (FTC) and looming legislation from Congress, Big Tech could be facing its biggest roadblocks yet. The public perception of tech at large has also shifted, with 68% of Americans saying they believe tech firms have too much power and influence in the economy – up from 51% in 2018. "Americans don't really like big things – people get worried about concentrated power," O'Mara said. "Nobody gets to be the golden child and be a \$2tn company. It is part of the lifecycle." Silicon Valley expands out of California The geography of Silicon Valley is changing, too, experts say. A catch-all term for the area south of San Francisco, the Valley has for nearly a century cemented itself in the public ethos as a center for innovation. It began its ascent as a tech hub when US military operations established sites for research contracts starting around the 1930s, a trend that continued into the private sphere over the next few decades. But the tech industry has been expanding far beyond California's Bay Area – a trend accelerated by the pandemic. In 2021, the electric car company Tesla moved its headquarters to Austin, Texas, after similar moves from other tech firms like Oracle and Hewlett-Packard. Covid has changed the whole game Brent Williams, senior technology recruitment consultant This has been reflected in hiring as well, said Brent Williams, who works at the Michael Page recruitment agency, adding that the effect is what the industry calls a "venture capital winter". "Covid has changed the whole game," he said. "It has become extremely competitive for companies to acquire talent because they're going not just for people in the Bay, but against everybody in the US." This trend, coupled with the rise in work from home policies, would have been shocking in pre-pandemic times – as tech companies invested billions in their sprawling campuses, providing employees with perks like transportation to and from work and elaborate on-site meals. 'The industry obituary has been written prematurely' Despite the growing list of roadblocks, "Silicon Valley remains incredibly robust," said Stanford economics professor Nicholas A Bloom. It has endured "multiple cycles", including downturns in 2001 and 2008, and has recovered each time, he added. "While some firms may be migrating outwards because of working from home and globalization, Silicon Valley is still ground zero, with no other area even close to its prominence in the industry," he said. Indeed, O'Mara said, we're unlikely to see a big shift away from the Valley's legacy or its physical place in the heart of the Bay. "The Bay Area and San Francisco has a resilient pull and distinctive qualities that are hard to replicate elsewhere," she said. "There is a reason people come there to live – they want to be there." This remains true, even as California faces a housing crisis, with employees flocking to cheaper states. "The industry obituary has been written prematurely a few times," she added. "It may be the end of an era for Silicon Valley, but it is unlikely to be the end of Silicon Valley."

*Source: The Guardian*

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## 6. Cleaner fuels

### Type: Trend

The advent of cleaner fuel sources is revolutionizing the supply chain industry. E-fuels, hydrogen, and inductive charging for electric vehicles are not only reducing our dependence on fossil fuels but also offering significant savings in energy costs. Major players in various sectors, from shipping to aviation, are investing in cleaner fuel sources, paving the way for a more sustainable and efficient supply chain industry. Tesla's megawatt charging stations and other EV chargers now more ubiquitous. These stations can recharge 70% of an electric semi's battery in under 30 minutes, which gives it a range of 300-500 miles. Initial calculations found that electric semis will save up to 83% in energy costs when compared with diesel fuel. Ford has piloted a prototype that has a robot EV charging station, which assists disabled drivers with fueling. Several hydrogen-powered fuel cells for maritime vessels are prototyping, and the first commercially hydrogen-powered vessel was launched in January 2022. Shipping giant Maersk pledged to source e-methanol, made from renewable hydrogen, from Spain for its cargo vessels. Dupont, Phillips, REI, Sisley, and Target recently signed on to become members of Cargo Owners for Zero Emission Vessels, which aims to switch ocean freight vessels to zero-carbon sources by 2040. Alaska Airlines, Microsoft, and Twelve partnered to create E-Jet, a fossil free and carbon neutral jet fuel produced from recaptured carbon dioxide, water, and renewable energy. Many countries struggle to meet demand for biofuels and renewable fuels. Adoption has been slowed by inflation and other economic uncertainties. But India's recent announcement about its intent to use biofuels and other green energy to reduce carbon emissions is encouraging. With new fuel sources, many vehicles in the transportation industry have greater ranges, expanding routes and adding flexibility to the supply chain. New regulations from the COP27 could increase investments in the biofuel industry. As the shipping industry migrates toward hydrogen fuel, and ground transport increasingly is taken over by electric vehicles, the supply chain industry will be dominated by companies that adopt greener fuel options. With diesel costs up to \$5.224, up \$1.509 from a year ago, the timing is right. The development of hydrogen fuel cells between now and 2030 will give an indication of their true viability.

*Source: Future Today Institute*

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## 7. Car Component Revolution

### Type: Wildcard

The car value chain landscape may witness significant changes in the coming years. With the rising demands for secure and ethical procurement of the raw materials used in car components, carmakers are urged to innovate their production processes at speed. Tesla, for example, has announced its plans to venture into the lithium mining industry to manufacture its batteries for EVs. The transformation of the car industry is right on the horizon. Despite the heightened expectations regarding the wider circulation of Electric Vehicles (EVs) in the near future, the reality is that EVs still account for only a tiny proportion of the total vehicle fleet worldwide. One of the obstacles lies in the current cost and performance of batteries used in EVs. Despite continued efforts to manufacture longer-range and lower-cost batteries, battery production uncertainties keep increasing. Lithium-ion batteries widely used in EVs are heavily dependent on rare materials such as lithium, nickel, and cobalt. Soaring prices and ethical questions involved in the mining process present obstacles to carmakers. Currently, 70% of the world's cobalt supply comes from the Democratic Republic of Congo, where human rights violations and high levels of corruption cast a shadow on secure procurement in the long run. Furthermore, the majority of mines in Congo are Chinese-owned, which gives China a strong geopolitical advantage. Manufacturers are urged to take action towards transparent and responsible car production. The movement to acquire raw materials from more responsible countries, such as Finland, is accelerating. Volvo Car Group, for instance, has started

implementing blockchain technology to boost the traceability of cobalt used in the batteries of its electric cars. Tesla has taken one step further to manufacture its own batteries, including lithium mining from a reserve they acquired in Nevada, US. So far, carmakers have purchased car components from the lower levels of the value chain and focused on designing and producing cars. However, this structure is beginning to change. As in the example of Tesla, makers are shifting their strategies on production lines to start owning in-house battery factories or mining and refining facilities. Doing so will protect them from future instability of supply chains and revamp battery production costs and quality. Thus, this deep vertical integration in the car industry is expected to increase further. Consumers will benefit from reduced EV prices and feel at ease that their vehicles are manufactured in an ethically appropriate manner. As a result, the car industry revolution will bring the production and circulation of EVs to the next level of prosperity.

*Source: Chief Executive;Automotive Logistics;Ars Technica;MINING.COM*

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## 8. Out of Batteries

### Type: Wildcard

Demand for electricity off the grid and during peak hours is going up. While batteries have a huge market potential, they bear the risk of becoming a major disruptor in case some of their raw materials like lithium, cobalt, and nickel become too rare and expensive. Without a massive growth of energy storage, a new energy crisis could become a possibility. When carbon-based fuels are replaced by wind and solar, maintaining steady energy sources for cities and industries becomes vital. To ensure electricity supply can match demand, large-scale energy storage to flexibly provide power is required. In other words, without rapidly increasing energy storage capacity, the risk of an electricity crisis is continually growing. The market for large-scale storage is steadily growing, and Tesla stands as one of the great successes in the industry. The company wants to produce cheaper batteries for its electric cars, but it also aims to be number one in the energy storage business. In 2017, they started 20MW / 80 MWh energy storage facility in Mira Loma, California. Now the latest project revealed in 2021 aims to build more than 100MW energy storage system in Angleton, Texas. This battery size could power about 20,000 homes even on a hot summer day. One efficient way of realising energy mass storage is to pump water reservoirs high to the mountains during energy surplus and let it flow through turbines when there is an energy shortage. The latest invention of utilising water reservoirs is to fill former oil and gas wells with pressurised water and let it run back through turbines. Solutions may vary between industrial and domestic-use energy storages. Still, there is no way around the fact that we need bigger and better batteries. Getting off fossil fuels requires advances especially in energy storage technologies. Large- or utility-scale energy storage systems would become an integral part of the sustainable power system in the future. They are an indispensable element in providing stability and flexibility to an energy distribution system even when the electricity production level from solar and wind fluctuates with weather. However, for energy storage systems to truly become sustainable, drastic improvements are required. Currently, the most common type of battery used in energy storage systems is lithium-ion batteries, which rely on rare minerals such as cobalt, lithium, and nickel. There have been a range of supply chain risks, as the production and processing of these minerals is often geographically concentrated and dominated by countries where there have been allegations of labour and human rights violations. Processing the used batteries is another problem. At the moment, recycling of dead batteries is not catching up with the demand of new batteries. The battery industry still has much to do before they can claim to be a winner in sustainable development.

*Source: Autovista24;TechHQ;Euronews;Quartz;Bloomberg;Smart Energy*

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## 9. Circular Economy in Mobility

### Type: Trend

The concept of a circular economy in mobility focuses on creating sustainable, efficient transportation ecosystems by designing products and systems with an emphasis on durability, reuse, and recyclability. This approach aims to minimize environmental impact by reducing waste and conserving resources throughout the lifecycle of mobility solutions, from manufacturing to end-of-life. By embracing principles such as modularity, remanufacturability, and material recycling, the mobility sector can significantly contribute to environmental preservation and resource efficiency.

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Examples and Real Illustrations of Circular Economy in Mobility

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Electric Vehicle (EV) Battery Recycling Programs:

A key aspect of circular mobility is the recycling of electric vehicle batteries. Companies like Tesla and Nissan are pioneering battery recycling programs to reclaim valuable metals and materials from spent EV batteries. These materials can then be reused to manufacture new batteries, reducing the need for virgin materials and lowering the environmental footprint of EV production.

Vehicle Sharing and Subscription Services:

Vehicle sharing and subscription services exemplify circular economy principles by maximizing the utilization of vehicles and reducing the need for individual ownership. For example, services like Zipcar and Lyft's subscription plans offer access to a fleet of vehicles for short-term use or long-term rental, respectively. This model not only decreases the number of vehicles needed but also encourages the development of more durable, maintainable vehicles designed for shared use.

Modular Vehicle Design:

An innovative approach to circular economy in mobility is the development of vehicles with modular designs that can be easily upgraded or repurposed. The Dutch company, Lightyear, is working on electric vehicles with modular components that can be individually replaced or upgraded, extending the vehicle's lifespan and reducing waste. This not only makes vehicles more sustainable but also allows consumers to adapt their vehicles to evolving technology without needing to purchase a new car.

Source: IF - ORION.AI

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## 10. The self-driving trolley problem: how will future AI systems make the most ethical choices for all of us?

### Type: Weak Signal

Artificial intelligence (AI) is already making decisions in the fields of business, health care and manufacturing. But AI algorithms generally still get help from people applying checks and making the final call. What would happen if AI systems had to make independent decisions, and ones that could mean life or death for humans? Pop culture has long portrayed our general distrust of AI. In the 2004 sci-fi movie *I, Robot*, detective Del Spooner (played by Will Smith) is suspicious of robots after being rescued by one from a car crash, while a 12-year-old girl was left to drown. He says: I was the logical choice. It calculated that I had a 45% chance of survival. Sarah only had an 11% chance. That was somebody's baby – 11% is more than enough. A human being would've known that. Unlike humans, robots lack a moral conscience and follow the "ethics" programmed into them. At the same time, human morality is highly variable. The "right" thing to do in any situation will depend on who you ask. For machines to help us to their full potential, we need to make sure they behave ethically. So the question becomes: how do the ethics of AI developers and engineers influence the decisions made by AI? Read more: After 75 years, Isaac Asimov's Three Laws of Robotics need updating The self-

driving future Imagine a future with self-driving cars that are fully autonomous. If everything works as intended, the morning commute will be an opportunity to prepare for the day's meetings, catch up on news, or sit back and relax. But what if things go wrong? The car approaches a traffic light, but suddenly the brakes fail and the computer has to make a split-second decision. It can swerve into a nearby pole and kill the passenger, or keep going and kill the pedestrian ahead. The computer controlling the car will only have access to limited information collected through car sensors, and will have to make a decision based on this. As dramatic as this may seem, we're only a few years away from potentially facing such dilemmas. Autonomous cars will generally provide safer driving, but accidents will be inevitable – especially in the foreseeable future, when these cars will be sharing the roads with human drivers and other road users. Tesla does not yet produce fully autonomous cars, although it plans to. In collision situations, Tesla cars don't automatically operate or deactivate the Automatic Emergency Braking (AEB) system if a human driver is in control. In other words, the driver's actions are not disrupted – even if they themselves are causing the collision. Instead, if the car detects a potential collision, it sends alerts to the driver to take action. In “autopilot” mode, however, the car should automatically brake for pedestrians. Some argue if the car can prevent a collision, then there is a moral obligation for it to override the driver's actions in every scenario. But would we want an autonomous car to make this decision? What's a life worth? What if a car's computer could evaluate the relative “value” of the passenger in its car and of the pedestrian? If its decision considered this value, technically it would just be making a cost-benefit analysis. This may sound alarming, but there are already technologies being developed that could allow for this to happen. For instance, the recently re-branded Meta (formerly Facebook) has highly evolved facial recognition that can easily identify individuals in a scene. Read more: Facebook will drop its facial recognition system – but here's why we should be sceptical If these data were incorporated into an autonomous vehicle's AI system, the algorithm could place a dollar value on each life. This possibility is depicted in an extensive 2018 study conducted by experts at the Massachusetts Institute of Technology and colleagues. Through the Moral Machine experiment, researchers posed various self-driving car scenarios that compelled participants to decide whether to kill a homeless pedestrian or an executive pedestrian. Results revealed participants' choices depended on the level of economic inequality in their country, wherein more economic inequality meant they were more likely to sacrifice the homeless man. While not quite as evolved, such data aggregation is already in use with China's social credit system, which decides what social entitlements people have. The health-care industry is another area where we will see AI making decisions that could save or harm humans. Experts are increasingly developing AI to spot anomalies in medical imaging, and to help physicians in prioritising medical care. For now, doctors have the final say, but as these technologies become increasingly advanced, what will happen when a doctor and AI algorithm don't make the same diagnosis? Another example is an automated medicine reminder system. How should the system react if a patient refuses to take their medication? And how does that affect the patient's autonomy, and the overall accountability of the system? AI-powered drones and weaponry are also ethically concerning, as they can make the decision to kill. There are conflicting views on whether such technologies should be completely banned or regulated. For example, the use of autonomous drones can be limited to surveillance. Some have called for military robots to be programmed with ethics. But this raises issues about the programmer's accountability in the case where a drone kills civilians by mistake. Read more: Gun-toting robo-dogs look like a dystopian nightmare. That's why they offer a powerful moral lesson Philosophical dilemmas There have been many philosophical debates regarding the ethical decisions AI will have to make. The classic example of this is the trolley problem. People often struggle to make decisions that could have a life-changing outcome. When evaluating how we react to such situations, one study reported choices can vary depending on a range of factors including the respondent's age, gender and culture. When it comes to AI systems, the algorithms training processes are critical to how they will work in the real world. A system developed in one country can be influenced by the views, politics, ethics and morals of that country,

making it unsuitable for use in another place and time. If the system was controlling aircraft, or guiding a missile, you'd want a high level of confidence it was trained with data that's representative of the environment it's being used in. Examples of failures and bias in technology implementation have included racist soap dispenser and inappropriate automatic image labelling. AI is not "good" or "evil". The effects it has on people will depend on the ethics of its developers. So to make the most of it, we'll need to reach a consensus on what we consider "ethical". While private companies, public organisations and research institutions have their own guidelines for ethical AI, the United Nations has recommended developing what they call "a comprehensive global standard-setting instrument" to provide a global ethical AI framework – and ensure human rights are protected.

*Source: The Conversation*

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## 11. Optimus Primetime: Navigating a Future With Robots

### Type: Trend

Robots have been a cornerstone of science fiction for decades, but they are now closer to science than fiction—even though a survey of G7 countries found that the majority of respondents were uncomfortable with the idea of humanoid robots. Research has found that the presence of a robot decreases workers' feelings of meaningfulness and autonomy in their jobs. Incidents with robots outside the workplace have also incited frustration, and numerous reports of people damaging delivery robots suggest the tone of human sentiment towards them. Despite these concerns, the robotics industry is still garnering significant investment. Apple and other large companies have launched robotics programs, and some projections expect the market to nearly double over the next five years. The field seems to be at a turning point, largely because of the artificial intelligence (AI) boom. Consequently, it's worth examining what recent developments have been made in robotics, and how those developments may work their way into a variety of sectors. NEW DEVELOPMENTS IN ROBOTICS. Recent years have seen the rapid acceleration of AI interest in the tech industry. Now, some companies have started to look at how AI can be combined with robotics to enhance features of both. The vast amounts of data that AI scrapes across the internet can help more quickly teach robots a larger variety of skills, though robots still require visual data that isn't as plentiful (which some research teams are trying to innovate around). 37 Liquid neural networks (LNN) are another recent advancement at the intersection of AI and robotics; these structures are designed to handle continuous data streams using significantly less storage capacity and computing power than traditional neural networks. Integrating LNNs into robots allows them to adjust their behavior dynamically and adapt to changing environments. While AI-powered robotics generally focus on simple household or factory tasks, one of the more controversial applications has been weapons for war. AI-powered drones (see also AI Power Struggle) can track and fire at targets without human intervention, and robots that operate on land are in development. Given the ethical implications of creating machines that could make potentially fatal decisions, the UN recently passed a resolution encouraging countries to regulate the use of these weapons. While most specialty-purpose robots look very much like machines, people have long dreamed of a future where robots look like them. This future may not be far off. The first factory to mass-produce humanoid robots was recently built in Oregon, and Tesla is advertising jobs to train their humanoid robots. One humanoid robot just broke the running speed record for its kind, and others are able to watch and learn how to perform a variety of tasks. New advances in electronic skin, which imbues robots with touch sensitivity, could also contribute to more humanlike robots. Despite this progress, there are still a variety of hurdles that humanoid robots must navigate (literally and figuratively) to reach the level of integration imagined by their creators. It's still difficult for robots to adapt to the vast array of spatial and variable elements in their environments. Bipedal robots are also more structurally unstable, leading some to question their further development. Future advancements may remedy some of these concerns, though it's unknown how quickly this may occur. ROBO-COWORKERS. As technology advances, so too do

fears of its potential to replace humans in their jobs. While robots and AI are changing how some jobs are performed, the number of workers that will be displaced due to these technologies isn't clear. And, as noted above, robotics is creating new jobs. Planners should be aware of how robotics advancements may affect not just their field, but others as well. Robots are already being integrated into communities, including 38 public spaces. Thousands of delivery robots are in operation across cities globally, and services are expanding as companies partner with existing delivery services such as Uber. Autonomous robots are also being piloted to pick up trash and food waste, and prototypes are being considered for robotic crossing guards. Challenges include non-robot-friendly street and sidewalk environments, though the presence of robots may encourage the design of more accessible public spaces. But planners must consider policy concerns that arise from designing public spaces for robots, including privacy, equity, safety, and sustainability issues. Some robots are finding a home in private spaces. A shortage of care workers and the loneliness epidemic have left many feeling isolated and without the resources to take care of themselves (see also *Emerging and Intensifying Health Risks*). Social robots, which aim to stimulate cognition and offer companionship, have become more common in assisted-living facilities; officials have distributed them to elderly people in at least four states. But surveys have found that older adults aren't always comfortable with artificial companions, and concerns include data privacy and the potential of these robots to perpetuate the isolation they are trying to remedy. How widespread social robots ultimately become may have broader implications for people's relationships to robots and how they are prioritized in public and private spaces. The construction sector is also plagued by worker shortages. To compensate, some developers have brought on robots to take over more menial tasks. Relatedly, labor shortages have prompted energy companies to use robots in solar panel installation. Industry-wide attitudes towards robots appear to be changing, and their presence seems poised to expand. **CONCLUSION.** Takeout delivery and social companionship are far from the only roles that robots are playing in our societies. From preventing wildfires to farming, or making guacamole to assisting security guards, robots are assuming a presence in an ever-growing number of workplaces, and the integration of AI and robotics points towards rapid acceleration of their development. This doesn't mean, though, that the robots will take over. Collaboration with robots is possible and exists today. The extent to which this may change in the future won't be determined by robots, but by people. 39

*Source: American Planning Association;Tech Xplore;The New York Times;Bloomberg;Axios;New Atlas;The Verge;The New York Times;Futurism;Taylor & Francis Online;KTLA;Euronews;Built In;IEEE Spectrum;The New York Times;The Robot Report;NBC News;Mordor Intelligence;Robotics 24/7;Forbes;CIO;Smart Cities Dive;Carbon Brief;TED;VentureBeat;Nature;Model D;Cities Today;ABC10;Pew Research Center;TechCrunch;Harvard Gazette;ROBOTS;CNN;WIRED;Cornell University;NPR;UT News;Nature;Associated Press News;Reuters;Foreign Policy;MIT Technology Review;KUOW;Frontiers;The Register;The Verge;MIT Technology Review;Forbes India;Grist;Model D;Gallup;Popular Mechanics;The New York Times;Human Rights Watch;CNBC;The Seattle Times*

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## 12. Robot Redux

### Type: Trend

Make room for humanoid robots—they could soon be a staple in all homes. It might be the most unsettling sci-fi cliché of all, but it's drawing inevitably closer. Humanoid robots are coming to factories, offices, cities, and—possibly—homes in the coming years. Mechanical companions will assist with the drudgery that most of us would rather avoid, like hefting items around in a house move, administering medication to aging (and cranky) seniors, or simply keeping up with the cleaning. Humanoid robots as a serious consumer category became realer when Tesla, a company more recognized for its electric saloons, announced that its robot Optimus will be in production in 2025 and available for purchase in 2026. During an October 2024 event, the robots appeared uncannily competent. They seemed to work the room, hobnobbing with guests. One was clad in a cowboy hat and ordered to serve drinks at the bar. "I think this will be the biggest product ever, of any

kind,” said Tesla founder Elon Musk. The CEO neglected to mention that the demonstration robots weren’t acting autonomously, but were being remotely controlled by humans hidden behind the scenes, according to a report by Bloomberg . Nevertheless, Musk anticipates Optimus working in his factories as early as next year. A great leap forward for robotics came earlier in 2024 when Stanford University released its Aloha paper. This research revealed that robotics systems will need far less data than previously expected for training. Hussein Kanji, a Stanford alumnus and founder of investment firm Hoxton Ventures, believes that this discovery will increase the rate of advancement for the category. “Unlike large language models, which can train on everything that’s written or image systems which can also train on very wide image libraries, robots have to train with real-world data,” Kanji tells VML Intelligence. “We don’t have people walking around with 24/7 recordings of movements to give to robotic models to teach them. The Aloha paper shows we don’t need nearly as much data as we thought to build compelling robotics. For consumers I think we’re still several years away from these deployments. The bigger place for robotics will be behind the scenes in more industrial settings.” And with a focus on safety, 1X, a robotics company backed by OpenAI, released a video teasing its new humanoid, Neo. “Safety is the cornerstone that allows us to confidently introduce Neo Beta into homes, where it will gather essential feedback and demonstrate its capabilities in real-world settings,” says Bernt Børnich, 1X CEO. Humanoid helpers were en masse at the Consumer Electronics Show (CES) 2025, showing off their advanced capabilities, with brands such as Nvidia providing physical AI systems to power humanoid robots. On display included Aptronik’s Apollo humanoid robot performing an array of industrial tasks including heavy load pick-ups and assisting with assembly lines. Meanwhile, on a mission to make robots more lifelike is Realbotix’s Aria, a modular system that promises to allow people to build their own robots. Its “next-generation ultra-realistic humanoid robot” first stepped out at CES. It arrives at a time when 44% of global gen Zers say they could see themselves falling in love with a chatbot/AI, suggesting the future of Aria could be the start of synthetic relationships for the younger generation. Investment is pouring into humanoid robots as their potential is recognized for production facilities, workplaces, and the home. Cardenas predicts that in the future, every house will have a robot.

*Source: VML Intelligence;Singularity Hub;Analytics India Magazine;Gizmodo;Fortune;Nature;Silicon Canals;PYMNTS.com;Fortune;The Robot Report*

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## 13. Is Switzerland’s Electric Vehicle Story A Preview For The Rest Of The Globe?

### Type: Weak Signal

For a long time, Norway was the ultimate trendsetter when it came to the future of electric vehicle adoption. Now there’s another country worth admiring. Known for exquisite chocolates, fine watches, secretive banks, and Roger Federer — Switzerland is now making some waves on the EV scene. It turns out that last year, an electric car sold more units than any other car (gasoline, diesel, hybrid, etc.) in Switzerland. The Tesla Model 3 didn’t just rule all EV sales in Switzerland, but also all types of cars. The following chart released by the Swiss IVT Astra shows that Tesla’s Model 3 has beaten the sales of every car in the country in 2021. To that end, Tesla sold 5,072 units of the Model 3 sedan in Switzerland in 2021. The closest Model 3 competitor in the country was the internal combustion engine Škoda Octavia, with 4,969 units sold. The closest electric vehicle that came anywhere near the Model 3’s sales was the Volkswagen ID.3, which came in 19th place on the 2021 Swiss car sales chart. Volkswagen sold 2,423 units of the ID.3 in Switzerland last year. According to the Swiss Federal Statistical Office, electric vehicle adoption in the country is growing at an exponential rate. Comparing Nov 2021 to Nov 2020, new car registrations for electric vehicles grew an impressive +63%. Interestingly, the sales of petrol and diesel vehicles dropped by 27% and 59% respectively. Hybrid vehicles remained somewhat stable. But electric vehicles made a big jump last year in Switzerland — and the lion’s share of the credit goes to Tesla. Keep in mind, Tesla’s Model Y was

only spotted getting shipped in Switzerland via trains in November 2021, so it did not even make it to the above top chart. Its presence, theoretically, should make a significant impact in 2022. Note that Tesla has made this historic achievement in Switzerland even though its European Gigafactory hasn't begun production yet. Once Giga Berlin is functional this year, the Model Y sales graph will (likely) reach the top position very fast. An earlier version of this article was originally published by Tesla Oracle. Revised update edited by EVANNEX. I don't like paywalls. You don't like paywalls. Who likes paywalls? Here at CleanTechnica, we implemented a limited paywall for a while, but it always felt wrong — and it was always tough to decide what we should put behind there. In theory, your most exclusive and best content goes behind a paywall. But then fewer people read it! We just don't like paywalls, and so we've decided to ditch ours. Unfortunately, the media business is still a tough, cut-throat business with tiny margins. It's a never-ending Olympic challenge to stay above water or even perhaps — gasp — grow. So ...

*Source: Cleantech News*

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## 14. Humanoid Robots

### Type: Trend

Humanoid robots are rapidly advancing from concept to deployment, driven by breakthroughs in AI, computer vision, and robotics hardware. Figure's \$675 million funding round, backed by Microsoft, OpenAI, and Amazon, underscores growing investor confidence in AI-powered robotics. OpenAI's partnership with Figure aims to enhance robots' language understanding and make them better at interacting with humans and autonomously adapting to tasks. Tesla's Optimus Gen2, unveiled last year, features improved dexterity and balance, while Amazon is testing Agility Robotics' Digit for warehouse logistics. Another example is Fourier Intelligence's GR-1, which addresses global aging trends by assisting eldercare residents. Despite rapid innovation, commercialization hurdles persist. High production costs, safety concerns, and the need for reliable general-purpose applications could slow adoption. The debate over humanoid versus task-specific robotic designs continues, with critics questioning the necessity of a human-like form for industrial applications. However, the race to develop AI-integrated humanoids is intensifying, with industry leaders betting that robots will soon fill labor gaps and redefine automation.

*Source: Peter Diamandis;Space.com;Designboom Magazine;TechCrunch;Singularity Hub;Business Insider;Peter Diamandis;Business Insider;The Robot Report;The Robot Report;Analytics Vidhya;New York Post;The Conversation;Geeky Gadgets;Computerworld;Peter Diamandis;Peter Diamandis;Peter Diamandis;The Robot Report;The Robot Report;Interesting Engineering;MDPI;The Robot Report*

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## 15. Human Brain-AI Symbiosis

### Type: Wildcard

Humans aren't necessarily doomed to lose the race against the AI, because an artificial general intelligence capable of deep learning may turn out to be impossible to create. Also, if the AI would advance in great leaps, it wouldn't necessarily become truly learning, intelligent, or unfathomable to us. At the same time, it may be possible to increase the capacity of human brains with the help of computers and, for example, neural programming, to be equal with a future super AI, or even exceed it. Machine intelligence and machine learning are the parts of AI which are advancing rapidly, and in many visions, they are feared to replace all human labour. It is also feared that a self-developing AI will become incomprehensible, and hence uncontrollable, for the humankind. Even if the development of the AI would not advance nearly as quickly, the computer farms of the future will far exceed the capacities of the human brain. However, processing power, problem-solving ability and machine learning are entirely different things than real intelligence, human thought and deep learning, which all are needed to solve the most complex problems. Creating an AI software or an AI-robot

manifesting these features, which are now only present in the human brain, may ultimately turn out to be impossible. A competing approach to AI software is the modification of the human brain so that it will become super-efficient and directly connected to a computer, possibly also to the internet. In the wildest visions, this could make a shared human intuition a possibility and even enable the creation of the so-called global brain. Neuralink, founded by the SpaceX and Tesla CEO Elon Musk, tries, on its part, to develop a brain-machine interface with a high-speed bandwidth, which is designed to replace all external devices required to communicate and interact with a symbiotic AI. Moreover, the primary goal of Neuralink is to make humans able to rise to the challenge created by the AI development, i.e., to keep the AI under control. Moreover, AI and humans are not necessarily doomed to be antagonistic towards each other. Recently, a novel type of AI that aims at a fusion of the human brain and machine intelligence is gradually gaining attention. It will be a bioelectronic hybrid AI, in which a human brain and a computer will be connected to work together in a dual complementary system. Both can complement and reinforce each other to create a completely new intelligence that a single party would never achieve alone. If Neuralink or any other attempts to directly wire the brain with computing power succeed, the human brain will receive a digital third level. It would transform humans into super-intelligent cyborgs that could solve problems previously considered unsolvable. There is a high risk, however, that this development can lead to massive inequality. Furthermore, it also presents economic, social, and security-related uncertainties that we currently cannot even imagine. Still, the synergy of human and machine holds a hope for the future as well. Enhanced global intelligence, or global brain, co-created by human and AI could enable information exchange in a split second via electrical impulse in neurons, without communication media such as sound or texts. It may eliminate the boundaries of ethnicity, different native language or geographical location in human communication and create a whole new level of collective intelligence against wicked problems on this planet.

*Source: All Israel News;TNW;Nautilus;The Independent;Fortune;Futurism*

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## 16. Humanoid Robots Entering the Workforce

### Type: Trend

Humanoid robots are beginning to operate in real industrial settings. In 2024, BMW tested a humanoid on an assembly line in Spartanburg, where it performed physically taxing tasks such as inserting heavy, awkward sheet-metal parts into body fixtures with precision, improving safety and ergonomics. Unlike fixed industrial arms, humanoids can navigate human-centric environments and adapt to multiple tasks. Other efforts (Tesla's Optimus and several startups) signal broader momentum. Challenges remain (cost, reliability, safe human-robot collaboration), but early deployments show rapid improvement in manipulation and autonomy. The trajectory suggests expanding roles in logistics, manufacturing, and hazardous inspections – initiating a new era of flexible automation alongside human workers.

*Source: ASSEMBLY Magazine*

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## 17. Elon Musk's Neuralink to start clinical trials of implanting brain chips in humans

Type: Weak Signal

Billionaire Elon Musk's company Neuralink is conceiving implants to be able to communicate with machines by thought. Neuralink's first clinical trials with a small number of human patients would be aimed at treating paralysis or paraplegia, the company's head surgeon Dr. Matthew MacDougall said. The neurotechnology firm aims to develop implants that can treat neural disorders and that may one day be powerful enough to put humanity on a more even footing with possible future superintelligent computers. Musk described Neuralink's chip, which is roughly 23 millimeters (0.9 inch) in diameter, as "a Fitbit in your skull with tiny wires." Neuralink wants to first use the device with people who have severe spinal cord injury to help them talk, type and move using their brain waves. The brain-chip startup had released footage on Friday appearing to show a monkey playing a simple videogame after getting implants of the new technology. Neuralink works by recording and decoding electrical signals from the brain using more than 2,000 electrodes implanted in regions of the monkey's motor cortex that coordinate hand and arm movements, the video's voiceover said. Musk has a history of bringing together diverse experts to develop technology previously limited to academic labs through companies such as Tesla Inc, SpaceX and Boring Co. Hooking a brain up directly to electronics is not new. Doctors implant electrodes in brains to deliver stimulation for treating such conditions as Parkinson's disease, epilepsy and chronic pain. In experiments, implanted sensors have let paralyzed people use brain signals to operate computers and move robotic arms. But Musk's proposal goes beyond this. Neuralink wants to build on those existing medical treatments as well as one day work on surgeries that could improve cognitive functioning. Neuralink is not the only company working on artificial intelligence for the brain. Entrepreneur Bryan Johnson, who sold his previous payments startup Braintree to PayPal for \$800 million, started Kernel, a company working on "advanced neural interfaces" to treat disease and extend cognition, in 2016.

Source: WION

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## 18. Batteries in Cars, Batteries in Grids

Type: Trend

Vehicles account for most demand, but batteries are increasingly prevalent in power grids. By the year 2030, passenger cars will account for the biggest share of global battery demand, at about 60%, followed by commercial vehicles (23%), according to the Global Battery Alliance. Also by 2030, consumer electronics (think iPhones and tablets), will shrink from more than a fifth of the global battery market to only a "marginal" share, according to the alliance. As global battery demand grows by an expected 25% annually from now until 2030, they will power not only increasingly electrified transportation, but will also facilitate a shift from fossil fuel power generation to more sustainable models - via the deployment of batteries in power grids (and more decentralized, off-grid applications). Renewable energy sources tend to be intermittent (the sun is not always shining on solar panels, for example), creating an important role for batteries as a "balancing solution" capable of storing renewable energy until it is needed. In many ways, batteries are better suited to this role than, for example, pumped hydroelectric power - because of their flexibility (they can be installed in just about any environment) and relatively quick response times. Between 2015 and 2018, energy-storage battery demand grew by as much as 70% per year, and by the year 2030 roughly 220 gigawatt hours-worth of grid-connected batteries are expected to be installed, according to the Global Battery Alliance. Tesla installed a \$96 million "big battery" in South Australia that is now used to provide storage and stability for the local power grid, and the company has indicated that the project has since led to even larger orders. Research is underway to bolster the safety of energy-storing

technology - and mitigate incidents like the 2019 explosion and fire at a battery storage system installed by an Arizona utility to capture solar energy near Phoenix, which injured several people. Work is also being done to further develop so-called vehicle-to-grid, or V2G technology, which could coordinate power sharing between grids and plugged-in vehicles - and feed necessary energy into a grid during times of peak demand or emergencies. While this technology is still a work in progress, hopes are high that it could help answer questions about how to feed more intermittent - but necessary - sustainable energy into public power systems.

*Source: Future Today Institute*

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## 19. Robotaxi Expansion

### Type: Trend

Robotaxis are entering a period of accelerated growth, driven by technological advancements, regulatory shifts, and shifting consumer sentiment. In 2024, Waymo doubled its weekly paid trips to 100,000 and expanded service to multiple new US cities, including Los Angeles, Austin, and Miami. Baidu's Apollo Go robotaxi division is on track to reach profitability in 2025, aided by its ability to cut vehicle costs to \$28,000—far lower than US competitors like Waymo, whose vehicles cost upward of \$150,000. Tesla is also entering the space, with plans to launch its own robotaxi service in Austin by mid-2025. However, regulatory challenges remain a key factor. Cruise, GM's self-driving unit, was forced to shut down after a high-profile accident led to regulatory scrutiny and loss of operational permits in California and Texas. Waymo faces a new federal investigation into 22 incidents involving its vehicles, per NHTSA. Despite these setbacks, data suggests that robotaxis may already be safer than human-driven cars: A 2024 Swiss Re study found an 88% reduction in property damage claims and a 92% reduction in bodily injury claims for Waymo vehicles compared to human drivers. Internationally, China is leading adoption, with Baidu expanding to Hong Kong and Singapore, and Wuhan aiming to become the first fully driverless city. Waymo announced plans to test its robotaxis in Tokyo in 2025, marking its first international expansion. With both technological and operational hurdles being addressed at an accelerated pace, robotaxis are approaching a pivotal tipping point in adoption.

*Source: The San Francisco Standard;TechCrunch;The Verge*

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## 20. Battery Demand and Production

### Type: Trend

Companies are investing billions of dollars in battery facilities to meet growing demand. The cost of batteries essential for manufacturing electric vehicles has plummeted during the past decade, from about \$1,400 per kilowatt hour to roughly \$100 per kilowatt hour - enabled by a massive scaling-up of production. In 2019, a Volkswagen executive told the New York Times that the German automaker was paying less than \$100 per kilowatt hour for batteries - a price generally accepted as the point where electric cars can start becoming more affordable than internal combustion models. Tesla was also reportedly on track to reach a cost of less than \$100 per kilowatt hour as of 2018. Between 2010 and 2018, total battery demand grew by 30% annually, reaching a total volume of 180 gigawatt hours, according to a report published in 2019 by the Global Battery Alliance. The market is expected to continue growing by 25% annually until 2030, ultimately reaching a volume of 2,600 gigawatt hours, according to the report. The main drivers of demand growth: the electrification of transportation, and the deployment of batteries in electricity grids (by 2030, passenger cars will account for 60% of global battery demand, according to the report). Car and battery manufacturers have been establishing a growing number of production facilities, such as Tesla's Gigafactory near Reno, Nevada in the US, which the carmaker jointly owns and operates with its battery supplier Panasonic.

According to a 2019 media report, Tesla, which has indicated that a lack of available batteries from outside vendors has constrained its production, is also working on a means to manufacture its own battery cells. Northvolt, a Swedish battery maker, raised \$1 billion in funding in 2019 from investors including Volkswagen and BMW in order to help it complete Europe's biggest lithium-ion battery plant, at roughly the same time that Chinese battery cell manufacturer CATL (Contemporary Amperex Technology Co. Ltd.) disclosed plans to invest €1.8 billion in a production facility in Germany (more recently, CATL disclosed an agreement to supply batteries for Daimler trucks). This increase in production could help curb carbon emissions as it creates jobs. Increasing electric vehicle production may result in the creation of 10 million jobs, and about \$150 billion in economic value as it contributes to progress related to the Paris Agreement on climate change, according to the Global Battery Alliance.

*Source: Future Today Institute*

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## 21. General-Purpose Robots

### Type: Trend

General-purpose robots are evolving rapidly, fueled by AI breakthroughs, advanced sensory systems, and increased investment. Companies like Figure AI and Sanctuary AI are leading the charge with humanoid robots designed for diverse applications, from warehouse logistics to eldercare. Figure AI's Figure 02, tested at a BMW facility, demonstrates real-world adaptability, while Sanctuary AI's Phoenix, equipped with haptic sensors and AI control, learns new tasks through simulation and demonstration. Meanwhile, China's Agibot has claimed the mass production of nearly 1,000 humanoids, signaling a push toward large-scale deployment. A major bottleneck in general-purpose robotics is training, but new AI-driven approaches are accelerating progress. MIT's Heterogeneous Pretrained Transformers, inspired by large language models, allows robots to learn from vast, diverse datasets, improving their adaptability to novel tasks. Similarly, RoboCat, a self-improving AI agent, can train robotic arms in as few as 100 demonstrations, significantly reducing the need for human oversight. These developments suggest that robots capable of performing multiple, complex tasks with minimal retraining are closer than ever. As industry adoption grows, commercialization efforts are ramping up. Tesla's Optimus is slated for limited manufacturing in 2025, with broader deployment expected in 2026. Pudu Robotics and Wisson Robotics are also introducing new bipedal and soft-bodied robots with expanded capabilities. The International Federation of Robotics predicts that general-purpose robots will transform manufacturing, logistics, and service industries by mid-decade, making them essential workforce tools rather than futuristic concepts.

*Source: TechCrunch; MIT - Massachusetts Institute of Technology*

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## 22. Daily Automation

### Type: Trend

Advanced robots are being used to automate simple to complex tasks. Trend - Robotics companies are launching advanced robots capable of automating tasks in the workplace and the home. These robots have dexterous limbs, precision accuracy, and reliable problem-solving skills. Businesses are using these to automate simple and menial to complex jobs in the workplace. Insight - Some of the most undesirable tasks in the workplace and in the home are menial, repetitive duties. The agents responsible for these tasks often burnout of their jobs quickly, leading to high turnover rates in the workplace, or tasks left unfinished in the home. Given the simplicity of many of these tasks, businesses desire automated solutions that alleviate strain from workers to focus energy on more complex tasks. Robotics brands are launching dexterous, capable robots in response.. At Tesla's 2023 shareholders meeting, Elon Musk introduced the Optimus robot, signaling a shift from electric

vehicles to robotics. This innovation isn't just a concept; Tesla has produced five walking prototypes, all equipped with components designed in-house.. EVE is a humanoid robot that can perform various tasks similar to humans, such as opening doors, fetching objects, and monitoring security. EVE is developed by 1X Technologies, a Norwegian robotics company that is backed by OpenAI, the leading artificial intelligence research organization. EVE is powered by advanced AI systems that enable it to learn from its environment and adapt to different situations. EVE is designed to be safe, smart, balanced, and to benefit society with its capabilities.. Fourier, a Shanghai-based venture firm, has unveiled its latest creation, the GR-1 humanoid robot, empowered by artificial intelligence. This thoughtfully designed robot is distinguished by its bipedal locomotion, capable of walking at a speed of 5 km per hour while holding up the device's combined weight of 55 kg. Reportedly, plans are in place to initiate mass production of the GR-1 by the conclusion of 2023, with thousands of units slated for delivery in the subsequent year.. The 'Phoenix' is a humanoid general-purpose robot that can perform a wide range of work tasks in various industries. It is the sixth-generation robot developed by Sanctuary AI, a company that aims to create human-like intelligence in robots. Phoenix stands at 5 feet 7 inches and weighs 155 pounds, with a maximum payload of 55 pounds and a maximum speed of 3 miles per hour. It has industry-leading robotic hands with 20 degrees of freedom that can manipulate objects with high dexterity and precision. It also has a bolder color palette and elevated textures that enhance its aesthetics.. Agility Robots unveils the latest version of its Digit robot with the new Digit 2.0, which is a bipedal assistant that is specifically made to aid human workers in logistic operations. The new version has an updated android and most notably, a head. It is white in color and features large LED lights as eyes, which also blink to hint at the direction and intention of the robot.

*Source: Trend Hunter;New Atlas;1X Technologies;The Indian Express;FOURIER-Robotics;Medium;Sanctuary AI;DesignTAXI*

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## 23. Assistive amusement park robots

### Type: Trend

Enhancing the guest experience at theme parks is not just limited to data collection, applications, and customer experience management systems. Enter the latest generation of theme-park robots, which go beyond animatronic experiences to also enhance service touchpoints and operations. Robots-as-a-Service are coming to interactive exhibits and theme parks. Japanese startup Avatarin uses robots powered by an edge AI platform to serve as surrogates for remote visitors. The bots can be steered remotely from a user's home computer, allowing the virtual guest to experience museums from anywhere in the world. No stranger to the use of robots at its parks, Disney has several applications in the works, including soft robots that provide interactive guidance or entertainment to guests in its stores, humanoid robots that can conduct stunts to allure audiences, and drone displays and shows by Dronisos that light up the night sky. Disney has even submitted a patent for what it calls a Robotic Sherpa, essentially a moving locker system that would autonomously follow guests around the premises, storing their items. Meanwhile, Universal filed a patent for an edible soft robotic system, which is exactly what it sounds like. Imagine an edible Santa Claus doing a dance on your plate before you eat him. Robots are not new to amusement parks—Disney has been using robots, primarily animatronics, since nearly its inception. What is new is the breadth and quality of activities these machines can provide. In the near future, each guest could have their own personal robot guide, carrying purchases, holding conversations, adjusting itineraries in real time, and sharing experiences with loved ones who weren't able to join. But robots will not just be limited to customer-facing aspects of the parks. Disney has also set its sight on robots capable of sculpture and fabrication. As this technology advances, theme parks could use these machines to build structures within their resorts. If Tesla's Optimus robots perform as promised, or even close to it, autonomous humanoid robots could eventually pervade both back-of-house and front-of-house operations of

resorts, theme parks, and museums.

Source: Future Today Institute

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## 24. Behavioral Shifts and Mobility Demand

### Type: Trend

The trend of Behavioral Shifts and Mobility Demand delves into the dynamic interplay between evolving work habits, such as the widespread adoption of remote work, alterations in lifestyle choices, and shifts in consumer preferences, all of which significantly influence the demand for various mobility solutions. This trend acknowledges the profound impact that societal changes, accelerated by technological advancements and global events like the COVID-19 pandemic, have on how people choose to move within and between urban environments.ð

ð Remote work, initially a necessity during the pandemic, has become a preferred mode of operation for a significant portion of the workforce, reducing the need for daily commutes and altering peak travel times. Lifestyle choices, including an increased focus on health, wellbeing, and environmental sustainability, have led to a higher demand for active mobility options, such as cycling and walking, as well as a surge in interest for green transportation alternatives. Consumer preferences are also shifting towards more flexible, on-demand mobility services, reflecting a broader trend of seeking convenience, efficiency, and personalization in transportation.ð

ð Below we present real illustration of Behavioral Shifts and Mobility Demand.ð

ð Rise of Micro-mobility Services:ð

One of the most visible examples of this trend is the explosive growth of micro-mobility services, such as e-scooters and bike-sharing platforms, in cities around the world. Companies like Lime and Bird have capitalized on the demand for short-distance, flexible transportation options, particularly among younger urban populations who prioritize convenience and environmental considerations. These services not only cater to the last-mile connectivity needs but also embody the shift towards more sustainable urban mobility solutions.ð

ð Expansion of Remote Work Policies and Impact on Public Transport:ð

The shift towards remote and hybrid work models has had a tangible impact on public transportation systems. For instance, cities like San Francisco and London observed significant drops in public transit ridership during the peak of the pandemic, and although there has been some recovery, the numbers have not fully returned to pre-pandemic levels. This reduction reflects the decreased need for daily commutes, prompting cities and transport agencies to rethink and redesign public transportation services to accommodate more flexible schedules and ensure financial sustainability.ð

ð Growth in Electric Vehicle (EV) Adoption:ð

Another manifestation of behavioral shifts impacting mobility demand is the accelerated adoption of electric vehicles, driven by increased environmental awareness and supportive government policies. Automakers like Tesla, Nissan, and Volkswagen are reporting record sales, indicating a growing consumer preference for cleaner, more sustainable personal transportation options. This trend is supported by expanding EV charging infrastructure and advancements in battery technology, making EVs more accessible and practical for a wider range of consumers.

Source: IF - ORION.AI

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## 25. Guochao Goes Global

### Type: Trend

Consumers are increasingly turning to Chinese brands. The term guochao or “national wave” is used to describe the popularity of indigenous brands among Chinese consumers. Recent years have seen Chinese brands such as Shein and Temu become more popular internationally, and BYD vies with Tesla to be the biggest EV maker in the world. This is despite attempts by governments in the US, Canada and EU to impose tariffs on Chinese-made goods. At the same time, Chinese culture more broadly is becoming increasingly popular, with the wider celebration of Lunar New Year and the embrace of Chinese fashion and C-beauty. Views on Chinese brands are growing more positive. While still lagging behind their US- and British-made counterparts on many metrics, Chinese-made products are increasingly seen by consumers as offering good quality, in addition to the value for money they were already known for. Strikingly, among younger Americans, attitudes to Chinese goods have improved while the phrase “Made in America” is increasingly seen as irrelevant. In 2025, many consumers around the world will take the initiative to set geopolitical concerns to one side and embrace Chinese brands and products in the interests of making their money go further. On the one hand, we see a Consumer Choice Explosion, with shoppers around the world able to take advantage of new brands and channels that offer game-changing pricing levels with acceptable quality. Set against this is the potential for Global Trade and Integration to be impacted by Global Tensions and Conflict – such as tariff wars between the US and China. Ongoing Cultural Globalization means that consumers around the world will be more aware of Chinese lifestyles and culture. A key trend driving consumer behavior here is Maximizing Value, as Chinese goods can offer substantial costs savings. This is still significant in an environment of elevated prices where consumers want budgets to stretch as far as possible. While a degree of Local Allure may mean some consumers opt for brands and products from their own country or region, Chinese brands may be able to appeal to consumers around the world by rooting their positioning and messaging in local culture. In addition to Chinese brands becoming more prominent around the world, we see commercial activity in the form of global brands making Chinese goods more widely available. Meanwhile, we see signals of the broader impact that the growing economic and cultural influence of China could have on the wider world. Chinese tea brand HEYTEA opened a pop-up store in Paris during the Olympic Games Discover the Collision platform – your 360° view of present and future consumers. This self-service, AI-powered platform delivers dynamic consumer insights and foresight, giving you a complete understanding of emerging trends. The competitive pricing and improved perception of Chinese brands clearly pose a challenge to established players. Each brand must decide how best to react. This may be by stressing quality and value over low price or appealing to national pride. Alternatively, adoption of Chinese manufacturing and cultural trends may be an option.

*Source: Foresight Factory*

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## 26. Provide value to drivers on the journey to EV adoption

### Type: Trend

The future of cars may be electric, but 2024 proved to be a rocky year. After a period of hype, many auto manufacturers announced aggressive timelines for launching new BEVs. Now, some are walking back or delaying some of their commitments, and EV purchases seem to have hit a plateau. Even industry giants like Tesla are facing difficulties: Its stocks slid in 2024, prompting the company to lower vehicle prices, expand into new markets and introduce new models. What’s causing the slowdown? Cost and convenience continue to play a factor for prospective buyers. EVs are still more expensive than gas-powered cars, making them feel like luxury purchases. Charging infrastructure remains a significant challenge, and many customers worry that they won’t have ready access to charging points when they need them. Charging an EV also comes with installation plus residential

electricity costs, especially in regions where electricity is more expensive than gas. EVs often depreciate faster than internal combustion engine (ICE) cars, losing more value in the secondhand market. In short, the total cost of EV ownership is higher than many drivers can justify. This financial risk, coupled with an uncertain economy, has discouraged many potential buyers. In this context, hybrid cars have regained ground with consumers. Between quarters one and two in 2024, sales of hybrids increased from 8.6 to 9.6 percent—a small but significant change, especially since they out-sold all-electric vehicles. These gains mean that consumers have even less of an appetite to purchase all-electric vehicles. Manufacturers will need to find new ways to bring customers along the EV journey. One approach is to make a clear value proposition. Dealers can educate customers about tax credits and subsidies to get the most out of their purchase. Additionally, OEMs can ease a critical customer pain point by helping them locate charging points. Publicis Sapient enabled Renault do just that when it partnered with the French manufacturer to build an app that helps EV owners find residential charging stations .

*Source: Publicis Sapient*

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## 27. CarOS

### Type: Trend

As CarOS (car operating systems) become central to the driving experience, automakers are reclaiming control of the tech behind them. Historically, tech giants like Google and Apple dominated the in-car software space through Android Auto and Apple CarPlay. General Motors is leading this new charge by eliminating CarPlay and investing heavily in its own Ultifi software, a bold move aimed at owning the user experience and unlocking new revenue streams. Honda, too, is developing its proprietary Asimo OS, leveraging AI to enhance automation and driver assistance. Meanwhile, Volkswagen's VW.os and Tesla's proprietary software continue to evolve, reflecting a broader industry trend toward in-house solutions. China is emerging as a CarOS powerhouse, with Polestar partnering with Xingji Meizu Group to tailor an OS for the Chinese market, while Xpeng Motors and Huawei collaborate on AI-driven systems with predictive maintenance and natural language processing. BMW, in contrast, is refining its Panoramic iDrive system by integrating augmented reality and smart home connectivity. The push for proprietary software is driven not only by differentiation but also by data ownership—automakers see CarOS as a gateway to monetization through subscriptions and over-the-air updates. Cybersecurity is now a critical focus, as high-profile breaches in 2024 underscored the risks of increasingly connected vehicles. The formation of the Automotive Cybersecurity Alliance signals a coordinated industry response. Open-source solutions like Elektrobit's Linux-based safety OS are also gaining traction, providing automakers with an alternative to proprietary platforms while maintaining compliance with ISO 26262 safety standards. As CarOS matures, automakers must navigate the tension between innovation, security, and user expectations in this software-defined era.

*Source: Future Today Institute*

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## 28. Autonomous Futures

### Type: Trend

From vehicles and humanoids to accessibility devices and vacuum cleaners, autonomous tech is leading the charge across industries. Autonomous innovation was a prominent feature during the 2025 Consumer Electronics Show (CES). During Nvidia's CEO keynote speech, Jensen Huang said, "It is very, very clear, autonomous vehicles have finally arrived," pointing to success from Waymo and Tesla. Waymo posted on X (formerly Twitter) in October 2024 that the Waymo One was already providing over 150,000 paid trips every week and believes the future of autonomous rides is here and growing. McKinsey has predicted autonomous driving could create \$300 billion to \$400 billion in revenue by 2035. At CES, a broad spectrum of autonomous vehicles and software was on show. Japanese mobility company Tier IV showcased its autonomous bus, featuring "a new data-sharing platform designed to scale the development of autonomous driving AI." Zoox gave live demos by providing robotaxi rides to and from the show in Las Vegas. John Deere showed off the scale of its autonomous vehicle capabilities with several new transportation innovations across agriculture, construction, and commercial landscaping. The Consumer Technology Association (CTA) CEO and vice chair Gary Shapiro believes that "autonomous vehicles are reshaping mobility." Autonomous tech is also supporting other sectors. Aiding the blind and low-vision community is Glide by Glidance, a mobility aid embedded with Glidance's Sensible Wayfinding technology, which autonomously guides the user with seamless ease and comfort. CTA futurist Brian Comiskey says Glidance is "a company adapting vehicle technology into a solution to bridge a gap in care." Glide is currently undergoing beta tests and is available for consumer preorders in 2026. The home is also getting a massive upgrade, with smarter and more intuitive cleaning robots such as Roborock's latest vacuum cleaner, the Saros Z70, which not only features the new StarSight Autonomous System 2.0 for more precise navigation and mapping, but also has a robo-arm to pick up stray socks and the like. Similarly, Dreame's X50 Ultra robot vacuum is the first of its kind with lifting wheels to navigate uneven surfaces and stray obstacles. It is officially launching in February 2025. For those with pools, Beatbot unveiled its AquaSense 2 Series, embedded with advanced AI-navigation and also available for purchase from February 2025—humanoid helpers en masse at CES showed off its advanced capabilities (for more see Robot redux, page 53). The age of autonomous everything has arrived. Having the foresight to embed autonomous technology into robots will be part of a future that builds ease into consumers' lives, allowing them free time to do more of what they want.

*Source: VML Intelligence; MIT Technology Review; The Verge; The Verge; MacTrast; TechCrunch; Daily Mail Online; Daily Mail Online; Daily Mail Online; The Atlantic; The Verge; FOX 7 Austin; The Verge; Los Angeles Times; The Washington Post; Futurism; The Verge; The Verge; The Verge; The Verge; Los Angeles Times; New York Post; The Conversation; The Verge; TNW; TechCrunch; The Verge; Silicon Republic*

## 29. Rise of Global Oligarchs

### Type: Wildcard

Rise of global oligarchs, i.e., a handful of people who largely control the economy and politics, may reach alarming levels in the coming years. The world is struggling with a deepening "polycrisis" that necessitates prompt actions and extensive funding. But as nation-states seem to be heading towards bankruptcy without prospects of necessary tax revenues or hope of growing the economy, the middle class is weakening, and most of the liquid money is flooding to a handful of billionaires at an accelerating pace, we are in a vicious cycle. Nation-states and international organisations may have to obey the rule of the emerging global oligarchy to survive. Oligarchy itself is not a new power structure. Wealthy individuals have always had a higher level of consciousness about their own economic interests and social status than individuals from lower classes. For example, the Russian oligarchs, who emerged with the collapse of the Soviet Union, can be seen as a quite similar concept as the Russian boyars, who used to be the noble co-rulers. Yet, the current oligarchs are basically

merely the president's chosen lieutenants who undertook different kinds of private sector "minister" roles with industrial and state security responsibilities, and who suddenly started to own major industries, including oil, natural gas, and other previously state-owned industries. As globalisation has been accelerating, oligarchy has also globalised. According to UBS Billionaire Ambitions Report 2022, the number of billionaires worldwide has reached 2,668, which is about 78% more than the 1500 billionaires in 2014. Their combined fortune has reached \$12.7 trillion, which is \$3.9 trillion more than what it was before the pandemic. The much larger group, the richest 1 per cent of people on Earth, who own over half of global wealth, made almost two-thirds of the new wealth created since the pandemic began. Extreme wealth concentration translates into power in politics, the economy, and the media. For example, the Koch brothers and many other billionaires in the US have significantly affected elections and have played a key role in shaping the political system. This means they could perpetuate policies beneficial for those in power, leading to favourable taxation and legal system for billionaires but unhealthy for the rest of the society. Or, as Oxfam and UBS say, billionaires and multinational corporations continue to be richer by avoiding paying their fair amount of taxes with the help of tax policies written by them. And even more than that, the whole global economy and the political system are in the hands of a handful of elites. Tax havens around the world are known to contribute to the rise of oligarchs on a large scale. Although aggressive tax planning and having offshore accounts are not illegal, this system allows global oligarchs to preserve their wealth and increase political and economic influence. According to an Oxfam 2023 report, Elon Musk, the CEO of Tesla, SpaceX and Twitter, paid a true tax rate of just over 3 per cent from 2014 to 2018, while a market trader selling rice and flour in Northern Uganda paid an income tax rate of 40 per cent. In fact, during the pandemic global poverty increased for the first time in 25 years. This current shift that Oxfam International calls "polycrisis" includes global cost-of-living burdens, widespread hunger, climate change impacts, war, and an unprecedented decline in human development. Two possible solutions to the situation could be, for instance, to increase tax on billionaires' income and some sort of "Tobin tax" for international money transactions that are not real investments. Oxfam, for example, proposed in their report titled "Survival of the Richest" that was addressed to the 2023 World Economic Forum in Davos: "As a starting point, the world should aim to halve the wealth and number of billionaires between now and 2030, both by increasing taxes on the top 1% and adopting other billionaire-busting policies (...) This would bring billionaire wealth and numbers back to where they were just a decade ago in 2012." A power structure in which a handful of individuals seizes control of the political and economic systems could lead to a massive crisis of democracy and a widening inequality gap. With the rapid increase of billionaires around the world and their increasing influence over various sectors, there is a concern that even nations regarded as democracies with free elections, free media, law-based systems and a separation of powers with checks and balances may move towards oligarchy. As the world is facing a "polycrisis", the simultaneous concentration of wealth and rise of global oligarchs is worsening the situation. As tax revenues aren't usually growing, but the magnitude of the problems is increasing exponentially, any political attempts to fix or mitigate the polycrisis merely lead either to deeper public debts, where the lenders, who are often billionaires, become even richer and gain more political power, or to pressing more money, which leads to inflation and more poverty. This vicious cycle could lead to political and economic chaos and the rise of true global oligarchs who could dictate to political leaders and any nation-states or international organisations more openly what can be done or not. All the money would be in their pockets, and almost bankrupt nation-states could only obey to survive.

*Source: The Washington Post; Caproasia; World Socialist Web Site; TheStreet; CNBC; The Guardian*

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## 30. Toyota commits \$70 bln to bolster electrification, shares rally

Type: Weak Signal

TOKYO, Dec 14 (Reuters) - Toyota Motor Corp (7203.T) on Tuesday committed 8 trillion yen (\$70 billion) to electrify its automobiles by 2030, half of it to develop a battery electric vehicle (BEV) line-up, as it looks to tap a growing market for zero-emission cars. But the world's biggest carmaker, which is a relative latecomer to full electric cars, said it expected annual BEVs sales to reach only 3.5 million vehicles by the end of the decade, or around a third of its current vehicle sales. That is less than bigger rivals such as Europe's No. 1 carmaker Volkswagen (VOWG\_p.DE), which in July predicted that half of its global vehicle sales will be battery-powered cars by that date. Even so, shares in Toyota and group companies Toyota Tsusho (8015.T) and Denso (6902.T) rallied on Wednesday, leading gains on the benchmark Nikkei 225 index (.N225). Toyota advanced 4.06% while Toyota Tsusho and Denso jumped 4.81% and 4.44%, respectively. Toyota's announcement comes as traditional automobile firms increasingly take on Tesla Inc (TSLA.O), which has become the most valuable carmaker this year. Tesla's market value reached over \$1 trillion in October, surpassing the combined value of Toyota, VW, Daimler AG (DAIGn.DE), Ford Motor (F.N) and General Motors Co (GM.N). Speaking at a press conference in Tokyo surrounded by more than a dozen planned BEV models, Toyota CEO Akio Toyoda said his company was still pursuing a multi-pronged, carbon-reduction strategy that also includes hybrid cars and hydrogen-powered vehicles. [1/2]Toyota Motor Corporation President Akio Toyoda speaks at a briefing on the company's strategies on battery EVs in Tokyo, Japan December 14, 2021. REUTERS/Kim Kyung-Hoon "We want to leave all people with a choice, and rather than where or what we will focus on, we will wait a little longer until we understand where the market is going," Toyoda said. His company's plan to introduce a full line-up of 30 BEV's by 2030 goes beyond the 15 models Toyota earlier said it would have available by 2025. The Japanese carmaker on Tuesday also said it planned to invest 2 trillion yen in battery production by 2030, up from the 1.5 trillion yen it announced earlier. That investment includes \$1.29 billion for a new battery plant in North Carolina that will begin production in 2025. read more EVs still only account for a small portion of car sales, but the market is growing rapidly, with new registrations up 41% in 2020 even as the global car market contracted by a sixth that year. In November, Toyota declined to join a pledge signed by six major carmakers, including GM and Ford to phase out fossil fuel cars by 2040. It argued that not all parts of the world would be ready to transition to green cars by then. read more In addition to electrified cars, Toyota is also developing internal combustion engines that run on hydrogen fuel. Toyoda said the technology could help to save some of Japan's 5.5 million auto jobs by allowing the car company to keep supply chains that would disappear with a full shift to electric cars. (\$1 = 113.6900 yen) Reporting by Tim Kelly; Additional reporting by Kevin Buckland; Editing by Shri Navaratnam and Ana Nicolaci da Costa Our Standards: The Thomson Reuters Trust Principles.

Source: Reuters

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## 31. Elon Musk says we should completely rethink government on Mars to get rid of special interests and 'coercion of politicians'

Type: Weak Signal

Elon Musk says there should be a direct democracy without representatives on Mars. He told a podcast that the eventual colony should get rid of "special interests" and "coercion of politicians." Musk also said SpaceX's plan to land humans on Mars should happen within 10 years. Morning Brew Insider recommends waking up with, a daily newsletter. Loading Something is loading. Thanks for signing up! Access your favorite topics in a personalized feed while you're on the go. download the

app Email address By clicking “Sign Up,” you also agree to marketing emails from both Insider and Morning Brew; and you accept Insider’s Terms and Privacy Policy Click here for Morning Brew’s privacy policy. Elon Musk says human settlement on Mars could be a second chance to build a better government. The billionaire Tesla and SpaceX CEO told podcaster Lex Fridman in a wide-ranging, 2.5-hour interview that putting humans on Mars is an opportunity to “rethink the whole nature of government, as was done in the creation of the United States” in the 18th century. He suggested ditching the representative democracy model for a direct democracy. “A representative democracy is subject to special interests and coercion of politicians and that kind of thing,” Musk said in the interview, published Tuesday. “I’d recommend that there is direct democracy — the population votes on laws themselves, and the laws must be short enough so that people can understand them.” Musk, often a vocal critic of US politicians and laws, said earlier in December that “government is the ultimate corporation,” and that regulations can hinder innovation. He also told Time that the government should not be involved in people’s assets, including his \$297 billion net worth. Musk also said during the chat that, worst-case scenario, SpaceX will land humans on the Red Planet in 10 years. The timeline for SpaceX putting humans on Mars has been discussed in the past — Musk said in March that his company will land rockets on the planet “well before 2030.” And in January 2020, he said he planned to build a fleet of 1,000 ships and launch three of them a day to eventually transport 1 million people to Mars by 2050. Musk is one player of many in the billionaire space race, with Amazon founder Jeff Bezos having flown to the edge of space via his Blue Origin company earlier this year. The firm plans to commercialize space travel and has since also taken actor William Shatner for a ride. SpaceX also flew a crew of tourists to space and back just days later. Virgin Galactic’s Richard Branson also flew to the edge of space himself in July. Critics have expressed concern with billionaires focusing on extraterrestrial endeavors amid problems that currently plague Earth — not to mention the massive carbon emissions from launches.

*Source: Business Insider*

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## **32. Jaguar To Turn All Electric By 2025; Land Rover to introduce 6 EVs in the next 5 years.**

### **Type: Weak Signal**

Jaguar will pivot away from its heritage to become a full electric car brand within five years, while its Land Rover stablemate will have six EVs by 2025, the British company announced this morning. The first all-electric Land Rover was due in 2024, Jaguar Land Rover CEO Thierry Bolloré admitted, to be followed by five more in rapid fire within two years. The announcement makes Jaguar the biggest legacy OEM to commit its future to electric cars, following similar announcements from Volkswagen Group-owned Bentley and BMW Group-owned Rolls-Royce. JLR would scrap its freewheeling attitude to chassis architectures to develop just three future model platforms, one of which would remain exclusive to the more luxury-oriented Jaguar brand. Bolloré today admitted the company was likely to sacrifice volume for profit on the journey to a zero-emission target of 2039 for the two premium brands, and zero tailpipe emissions by 2036. The company, owned by Indian automaker Tata, will also start testing hydrogen fuel cell electric prototypes on British roads this year as it looks to phase out diesel engines completely by 2026. The company has just one current EV - the critically acclaimed I-Pace that won the World Car of the Year award in 2019. “Reimagine will see us transition to being an electric-first business,” Bolloré said. “The purity of electric is the next natural step. At the heart of Reimagine will be the electrification of both the Jaguar and Land Rover brands. “By the middle of the decade, Jaguar will have undergone a renaissance to emerge as a pure electric luxury brand with a dramatically beautiful new portfolio of emotionally engaging designs and pioneering next-generation technologies. “In the next five years, Land Rover will welcome six pure electric variants as it continues to be the world leader of luxury SUVs through its three families

of Range Rover, Discovery and Defender. The first all-electric variant will arrive in 2024,” Bolloré confirmed. The new Reimagine Strategy document will see JLR switch from at least nine vehicle platforms to just three: the MLA flexible platform and the EMA platform for Land Rover, and a stand-alone modular architecture for Jaguar. The two Land Rover platforms will accept both BEV and electrified gasoline-fueled powertrains, while the Jaguar platform will be exclusively battery electric. “Two brands. Two distinct personalities. Both connected by the elements of quality and sustainability that underpin Jaguar Land Rover’s future of modern luxury by design,” Bolloré said. But JLR will not stop at battery electric vehicles. “Our aim is to achieve net zero carbon emissions across our supply chain, products and operations by 2039,” Bolloré confirmed. “As part of this ambition, we are also preparing for the expected adoption of clean fuel-cell power in line with a maturing of the hydrogen economy. “Development is already underway with prototypes arriving on UK roads within the next 12 months as part of the long-term investment programme.” Bolloré also admitted that JLR would spend 2.5 billion pounds a year for development to achieve its emissions goals - or around twice what Tesla spends, but far less than its German rivals. “With this strategy we will have positive cash net of debt in 2025,” Bolloré confirmed.

*Source: HardwareZone*

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## 33. A New Non-Alignment

**Type: Weak Signal**

This essay first appeared in GREEN, a journal from Groupe d'études géopolitiques. In March of this year, as Russia's war in Ukraine intensified, China's Foreign Minister Wang Yi made a trip to New Delhi to speak with his Indian counterpart S. Jaishankar. “If China and India spoke with one voice, the whole world would listen,” Wang argued. “If China and India joined hands, the whole world would pay attention.” The geopolitical scales soon started to tilt India's way. By April, European Commission President Ursula von der Leyen had made her first trip to Delhi, where she laid the groundwork for several weeks of frenetic EU-India dealmaking for a sweeping agenda ranging from defense to green manufacturing. The following month, in a whirlwind three-day tour of Germany, Denmark and France, Prime Minister Narendra Modi won concessions that Indian policymakers have coveted for well over two decades, ranging green-energy investments, tech transfers, and weapons deals, putting flesh on the bones of a moribund EU-India strategic partnership. In Berlin, Chancellor Olaf Scholz announced a €10 billion green partnership to help India achieve its 2030 climate targets and high-tech transfers. The next day in Copenhagen, Nordic countries signed wind and solar deals, alongside green shipping and green cities investments. In Paris, Macron signed deals to invest in India's green hydrogen hubs as well as increase sales of French military aircraft and ships; for its part, Électricité de France confirmed a long-pending deal to build six EPR-1650 nuclear power reactors in Jaitapur. This followed India's momentous \$42 billion investment deal with Japan for electric vehicles (EVs), green hydrogen/ammonia, and heavy industry transition. The timing of these rapid concessions is no accident. The divorce of China, Russia, and the West is providing Modi with a golden opportunity to negotiate a new geopolitical order. As the world splits into new Cold War blocs—which look strikingly similar to the old Cold War blocs—the old Indian grand strategy of non-alignment is reemerging. And this time, the rise of China assures that the new counter-hegemonic bloc will enjoy considerably greater resources than the former communist powers ever did. That emboldened confederation stretches beyond the subcontinent. India's last thirty years of catchup growth were achieved in an era of US global primacy. Along with other developing nations who have interests independent of the US, today, a much richer India has the leverage to challenge the coercive underbelly of American hegemony. Brazil and Indonesia, too, are taking advantage of their new pull. Neither the United States nor Europe should underestimate postcolonial elites in their renewed efforts to chart an independent course. Friction with the West is assured. But diplomats in the developing world are prepared to pay to avoid a costly and risky confrontation with the Sino-Russian axis. Developing

countries' answer to the West's question, "Do you want to contain China with us?" is probably "Yes." But the answer to the question, "Do you want to contain China and Russia with us?" is probably "No." Since 9/11, the US Department of the Treasury, National Security Agency, and Department of Commerce have developed a Panopticon over the key networks of globalization. The Treasury's Office of Foreign Asset Control and the SWIFT payments system surveilled financial channels; Edward Snowden's Silicon Valley surveillance internet provided a view into the flow of information; and the export control list of technologies gave it a map of supply chains. Key choke points were located and operated in the advanced industrialized states of the G7. Meanwhile, the US became more willing to weaponize the dollar system against troublemakers. The signal to developing countries was clear: if threatened, the US will exert its control over the technologies underpinning economic growth and military superiority. The G7's command of key technology remains the source of its hard power, as demonstrated by the design of its economic-warfare sanctions against Russia following its latest invasion of Ukraine. Sanctioning Russia's central bank assets and cutting off access to the SWIFT system signaled financial war. Then, a technological iron curtain fell, blocking high-tech exports to Russia's economy as well as critical airplane parts, while the G7 sought to block the supply of silicon chips (a key component of military hardware) from Korea and Taiwan. In October, the US escalated its containment of China by export control restrictions on chips. Countries like China, India, Indonesia, Brazil, South Africa, Mexico, Saudi Arabia, and the United Arab Emirates have refused to sacrifice their national interests to punish Russia. Most importantly, they believe their bargaining power in the new Cold War will result in sweeter trade, technology, and weapons deals from the West. These eight countries alone will account for three-fourths of the world's population and 60 percent of its economy by 2030. They have aspirations for regional dominance and believe non-alignment better serves their interests. Little wonder, then, that these countries are adopting a stance of non-alignment to secure the same key technologies—fighter jets, green technology, chips, submarines, nuclear, advanced pharmaceuticals, 5G mobile networks—that could power their catch-up growth. The map of countries that remained neutral on Russia sanctions is no bleeding-heart protest for global justice, but a hard-nosed security play. Before signing up to the West's new financial-technological-military regime, these countries intend to extract maximum concessions. They are also betting that the West will tolerate their foot-dragging on Russian sanctions, and refrain from imposing secondary sanctions (sanctions for breaking sanctions) on them. Threats to exit, as any bargainer knows, confer power. What exactly do the countries flirting with a new non-alignment want? 1. Core technologies to power future growth; 2. Advanced military hardware for enhanced security; 3. The upper hand in trade negotiations with Europe, the US, and the new Russia-China bloc; 4. Essential commodities like food, energy, metals and fertilizers from the new Russian-Chinese bloc; 5. Better terms to restructure their debt to Western and Chinese creditors during a punishing global dollar debt crisis that threatens their sovereignty. The Non-Aligned Movement (independence from colonialism and not formally aligned with or against any major power bloc, either East or West) started during the Cold War at the 1955 Bandung conference in Indonesia with 29 countries. It was institutionalized in 1961, survived the bipolar period, and fell into irrelevance after 1991. NAM currently has 120 members. Three large countries—China, Brazil, and Mexico—are observers. Source: Non-Aligned Movement Disarmament Database Reliance, the Indian conglomerate owned by billionaire and Modi-backer Mukesh Ambani, encapsulates developing countries' relationship with the G7. Ambani's Jamnagar refinery makes billions importing Russian crude oil and exporting diesel and gasoline to the West. Despite its flouting of Western sanctions, it continues to receive green technology transfers from the West. It has invested more than \$60 billion of its own cash and \$10 billion in partnerships and acquisitions of electrolyzers to manufacture hydrogen (from a Danish firm), photovoltaic wafers (from a German firm), solar panels (from a Norwegian firm), grid-scale batteries (from a US firm), and iron-phosphate batteries (from a Dutch firm). India's management of these foreign partnerships will depend on Dubai. UAE President Mohammad bin Zayed has positioned the Gulf Kingdom as a Club Med for oligarchs and merchant banks to skirt Western sanctions. Gulf petrostates are set to

gain an additional \$1.3 trillion in petro (dollar) exports over the next four years. Dubai lets non-aligned countries bypass sanctions, using commodities payments settled in yuan, rupees, and rubles to bypass dollars. Biden's Persian Gulf policy is adapting, with talk of security guarantees for the UAE and a new partnership with the US for a \$100 billion clean energy financing deal for developing countries. Gulf sovereign wealth funds are meanwhile investing in the energy transition across Eurasia. It's the old Indian-Arab-European sugar, spice, cotton trade route back with a bang. Under President Joko Widodo, Indonesia, too, is making its move by taking control of its abundant supply of nickel and copper—essential for the energy transition—and incentivizing investment in processing facilities. If the dream of becoming an electrostate is new, the tools are old. Indonesia is copying the developmentalist state successes of the East Asian Tigers as well as the 1970s nationalization drives of the OPEC countries. To howls of outrage by the European Commission at the World Trade Organization, Jokowi banned exports of nickel, forced international companies to refine and process it domestically, and sought technology transfer to state-owned enterprises. Indonesia has the largest nickel reserves in the world, with a majority controlled by its state-owned mining company, MIND ID. After Jokowi banned nickel exports, Chinese companies agreed to set up joint ventures in Indonesia along with transfer of critical high pressure acid leach (HPAL) technology that is required to make battery-grade nickel. While Germany's Volkswagen, Brazil's Vale, and the U.S.'s Ford and Tesla initially sought to secure unprocessed nickel from the country, Indonesia insisted on grabbing more of the value chain by creating an EV-producing national champion, Indonesia Battery Corporation, which has struck partnerships with China's CATL and South Korea's LG to obtain critical HPAL technology for battery-grade nickel. Jokowi's next targets for the "ban-exports-and-nationalize" treatment are tin (Indonesia is the world's second largest producer and the metal is used as solder to make electrical connections), aluminium (Indonesia is world's fifth largest producer and the metal is used in electricity and cars) and copper (used in, well, everything electric). Such policy independence nonetheless remains limited in the face of American sanctions. After the US threatened any client for Russian weapons with economic warfare, Indonesia canceled its planned purchase of Russia's Sukhoi-35 fighter jets, despite Russian offers of a dollar bypass palm-oil-for-fighter-jets scheme. Instead, Indonesia undertook a major escalation in defense spending to buy thirty-six US F-15s and forty-two Rafales from France, along with two of France's Scorpene submarines (the latter an emollient after France lost out on its sale of diesel subs to Australia) at a total cost of \$22 billion. When Russia shipped two S-400 air defense missile systems to India in 2021, it prompted a furious backlash from the US and threats to sanction India for the deal. Calls for constructive, non-coercive sanctions, remain unheeded. Brazil's president-elect Lula backed by the left-wing Workers' Party (PT), labor unions, community, racial and gender rights groups sustains a broad political commitment to sustainability and multilateralism. Perhaps most surprisingly, given his regime's proximity with the US, outgoing Brazilian President Jair Bolsonaro chose neutrality in the war. The material stakes make this choice seem obvious—Brazil's soy, corn, sugar, and meat exports are heavily dependent on Russian fertilizers, and so Bolsonaro has had an enormous stake in preserving relations. Moreover, Brazil's trade surplus with China is bigger than all its exports to the US. But the ideological current runs deeper. Under Luiz Inácio Lula da Silva, Brazil deepened relations not only with the BRICS and other Pink Tide governments, but also with the US. In 2011, the foreign minister boasted that Brazil had more embassies in Africa than Britain did. That willingness to make friends in both the Pacific and North Atlantic has given it greater room to maneuver, as when it broke HIV/AIDS drug patents in favor of Indian generics. Bolsonaro's free-market faction broke with that multilateralist tendency, siding against India, South Africa, and China when that bloc demanded Covid-19 vaccines free of intellectual property (IP) limitations at the World Trade Organization. It also joined the G7 on agricultural free trade policy, and sat out IP fights. Yet the Brazilian right's best efforts to quash protectionism were not enough to overcome the country's long aversion to G7 coordinated schemes; Brazil still chose neutrality on Russian sanctions. Elites in Brasília would rather keep their options open and their commitments light. Green industrial growth

compels some hard choices. Looking ahead, Brazil will need to prioritize either domestic industrialists or external allies as it weighs whether to develop flex-fuel cars fed by homegrown sugarcane ethanol or batteries sourced from China, Indonesia, and the nearby lithium triangle. In his victory speech, flanked by trade unionists and landless peasants, Lula pledged to pursue strategic non-alignment: "We will not accept a new Cold War between the United States and China. We will have relations with everyone." Brazil may defer choosing between North and South, but the choice between an inward-looking Brazil or an outward-facing one looks inevitable. There was a special irony to Brazil's right-wing capture. Under Bolsonaro, the country was perhaps the most cooperative with the G7-led order of any BRICS country. But Lula represents the developing world's best shot at leading a global non-alignment movement. Whereas the old non-aligned movement was anchored by moral imperatives—decolonization, anti-racism, nuclear disarmament—this fledgling version lacks a positive social and ethical program. Instead, it stems from the cold commercial and security logic of development. It will be up to that former unionist metalworker to forge a new coalition based on shared values. Developing countries will use this decade's violently shifting geoeconomic conditions to build on old growth models, including industrial policy and developmental-state capitalism. Expect states like India and Indonesia to keep imposing conditions on their increasingly coveted cooperation and access to growing consumer markets on hard infrastructure deals. If this is the general trend, there will be enormous variations in strategy. Brazil's program of development through social policy, including the signature Bolsa Familia cash grants, may be fully realized with Lula's return to power. Indonesia and India—who hold outgoing and incoming presidency of the G20—meanwhile, have favored policies centered on the buildout of electricity, roads, and ports, which can disregard human rights and bias deals toward powerful incumbents. In the extreme version, consider the Gujarat model that has formed the basis of Modi's aggressive electoral campaigns. The new non-aligned countries play the G7 powers off each other. Most exposed to this shifting terrain of economic and security relationships are Germany, Korea, and Japan whose industrial firms fear loss of their export markets. Thus far Germany is distancing itself from the decouplers in Washington. In his recent visit to China, Chancellor Scholz, flanked by CEOs of BASF and Volkswagen, said "New centers of power are emerging in a multipolar world, and we aim to establish and expand partnerships with all of them." Even as non-aligned countries negotiate within the new sanctions regime and find ways to use it to their advantage, we should not lose sight of the devastating toll of G7 sanctions, a blunt instrument that has torn up supply chains and created inflationary pressures. When emerging market elites can parley these conditions to their advantage, it is impressive. But even the most creative trade deals struck under terms set by the G7 are insufficient buffers against food and energy price volatility, unleashed by deregulated commodity markets run out of London and Chicago. Climate chaos on every continent, meanwhile, compounds these tensions, devastating the already threadbare lives of many. All the more reason, then, for the G7 to take a leaf out of the BRICS' playbook and coordinate investment in long-term sustainable infrastructure. The Polycrisis is a publication focusing on macro-economics, energy security & geopolitics.

*Source: Phenomenal World*

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## 34. Road to Autonomous Driving

### Type: Trend

The journey towards autonomous driving technology is marked by significant advancements, leading us towards a future where fully-autonomous vehicles will revolutionize transportation. These vehicles are set to enable "car-as-a-service" fleets, offering on-demand services akin to Uber but without the need for human drivers. This evolution will not only transform our approach to mobility but also the very design and functionality of vehicles themselves.ð

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As we edge closer to this future, we can anticipate a dramatic transformation in vehicle shapes and

sizes. Autonomous cars are poised to become functional “third spaces,” offering amenities for entertainment, sleeping, or even serving as mobile meeting rooms. This reimagining of vehicles will turn drive time into productive periods for work or leisure. Leading the charge in this field are companies like Tesla, Waymo (a subsidiary of Alphabet), and GM-Cruise, among others, who are actively developing fleets for these “car-as-a-service” models. This advancement is expected to reduce the cost of ground transportation by two to four times, making it more accessible and efficient.ð

In this new era, traditional driving may become obsolete for many, including the younger and older generations. Consequently, a significant portion of parking garages, driveways, and parking structures could be repurposed into alternative, usable spaces. The versatility of autonomous cars, with their varied shapes and sizes, will cater to diverse needs and preferences, providing spaces for entertainment, relaxation, or work.ð

ð Simultaneously, aerial ride-sharing and EVTOL (Electric Vertical Take-Off and Landing) technologies, often referred to as flying cars, are on the brink of becoming fully operational in major metropolitan cities. This innovation is set to drastically reduce travel times, thereby shrinking distances and transforming where we live and work. Previously hard-to-reach areas such as islands, rural regions, and mountaintops will become more accessible. EVTOL technology will also enable individuals in remote areas to conveniently access the amenities of city centers.ð

ð This meta-trend is driven by a convergence of various fields, including machine learning, sensor technology, materials science, advancements in battery storage, and the widespread availability of gigabit internet connections.ð

ð Autonomous driving technology is currently classified into five levels. Level one includes basic automated features such as collision detection and lane departure warnings. Level five represents full driverless automation. At present, the spectrum of autonomous features legally ready for public road use spans between levels two and three. Achieving level five, which denotes complete autonomy, is primarily hindered by data processing capabilities and regulatory challenges. This ongoing evolution in autonomous driving technology promises to redefine our concept of mobility and transportation, making it safer, more efficient, and accessible.

*Source: ITONICS; Peter Diamandis*

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## 35. Solar Satellites

### Type: Wildcard

Emrod has just demonstrated its wireless power beaming technology to Airbus and the European Space Agency (ESA) as part of the ESA's new push toward 24-hours-a-day space-based solar power. The idea of space-based solar is not new. The problem has always been size; you'd need transmitters and receivers about 2 km (1.2 miles) in diameter to shift a couple of gigawatts of energy down to Earth from a geostationary orbit some 36,000 km (22,370 miles) away. Building an array that size on Earth would be a huge challenge. Building one in space? Yikes. Emrod says its near-field energy beams could get the job done much more efficiently than competing technologies. But Emrod founder Greg Kushnir also thinks there's a much cheaper and easier way to satisfy European – and indeed global – renewable energy needs: by setting up a global wireless energy matrix capable of beaming power instantaneously around the planet, using lower-orbiting satellites that could be significantly smaller. You'd get 24-hour renewable energy, anywhere, out of low-cost solar assets right here on Earth. We wrote back in 2016 about GEIDCO's proposal for a global, interconnected renewable energy grid running through tens of thousands of miles of ultra high-voltage power lines. Emrod's World Energy Matrix concept would need far less ground- and ocean-floor-based

infrastructure, eliminating a ton of planning and execution headaches – or at least replacing those headaches with new orbital ones. But if you built a giant solar array in the Sahara desert in Libya, then just as the midday sun is beating down and creating maximum power, you could send that energy right across to power Shanghai as the sun begins to set. A global wireless energy network, working in all weather conditions, would unleash renewable energy at extraordinary scale Emrod "Essentially," says Kushnir, "we've been talking about decoupling where energy is generated from where it's consumed for a few years now. It would be the same order of magnitude of revolution as what wireless communication as done for our economy. You once had to move value from one side of the world to the other in the form of gold, in a sack on a ship. Now you can move financial value at the speed of light through wireless communication using satellites. But why just harvest the information out of those electromagnetic waves? Why not harvest the actual energy from these waves? Or both?" The company has scaled up the small, lab-based designs we wrote about in 2020. The current square transmitting and receiving antenna prototypes are 1.92 m (6.3 ft) in diameter. In the ESA demonstration, this gear sent some clean energy from one side of an Airbus warehouse to the other – a gap of just 36 m (118 ft) – to power a model city, a hydrogen electrolyzer and a beer fridge for Oktoberfest. But with the backing of NZ energy company Powerco it's already proven capable of doing the same over at least 200 m (656 ft) outdoors, and the company says it's ready for commercial deployment over much longer distances – basically, all that's needed is a direct, clear line of sight between the antennas or relays. Emrod recently demonstrated its wireless power beaming technology for the European Space Agency at an Airbus event in Germany Emrod A global wireless energy grid was of course proposed by Nikola Tesla around a century ago. The idea was famously shot down by banker J. P. Morgan, who asked, "if anyone can draw on the power, where do we put the meter?" Such a capitalist would have no such issue with Emrod's point-to-point technology, which needs to be precisely aimed at large, meter-friendly receiver arrays. "The technology is here," says Kushnir. "It's been developed, it's starting to be deployed. And when Airbus wanted to demonstrate it as part of a space-based energy infrastructure, there was no other company in the world that could do it. In the last few months, it seems the industry has been catching up with our vision and starting to throw budgets and teams at this. But we have a head start, we started this three years ahead of everybody else." "It's been floating around for decades," he continued. "The thing is, all the other teams that looked at power beaming treated it like communications – as a far-field system. And with far-field systems, you get side lobes – you're immediately giving up 15-20% of the power, which goes sideways. And the beam starts diverging, so you end up with a huge footprint and a gigantic antenna wherever you're trying to collect the energy. so the cost/benefits of these studies have always looked unrealistic. "We're not working with a far-field system. We've gone back to first principles and looked at it very differently, using a near-field system. Near and far field, by the way, isn't so much about distance, as about where you're focusing the beam and at what stages you're capturing it. We create a collimated beam with a phased array. It moves pretty much like it's in a virtual wire. Very well defined, no side lobes. And we capture it in the near field, or the Fresnel zones, to be more accurate. In this demo a few days ago, we demonstrated a beam collection efficiency over 95%. We know how to bring it around 99%, so it's already much more efficient than the theoretical limit you could get from a far-field system. Plus, we can make our antennas much smaller. We can benefit from focusing." Wireless power transmission is ready to move energy just as quickly as telecommunications data in a global satellite network, says Emrod Depositphotos The tech is ready to scale up to handle orbital distances at high efficiencies, and Kushnir says that with a leap in the efficiency of amplification, it'll be as efficient – or more efficient – to move energy via satellite than via city power grids. "If you're talking about what we could float up there in the next five years, it's probably an end-to-end efficiency around 60-70%. If we're talking about the European Space Agency's space solar timescales for 2040-2050, we can get much higher, probably to the same efficiencies of most of the grids around the world. Maybe not European or American grids, but well above most of the grids in the world. The benchmark, I think, would be

around 80-85%." Of course, in order to get a World Energy Matrix up and running, you're going to need a series of structures in space. These satellite antenna arrays would act more or less like lenses, taking an energy beam coming up from the ground, bending and refocusing it to send it on to another point, either straight back down to the ground or via another satellite. While these can be smaller than previously possible, they still won't be small. The size will depend on the distance, the distance will affect how many satellites you'll need in your constellation, and these will be just a few of the elements in a complex feasibility and cost-benefit equation. As an idea of the size, if an antenna was placed in an orbit around 400-500 km (250-310 miles) up, it'd need to be about the same size as the 108-m (357-ft) structure of the International Space Station, which orbits at about the same height. It'll be far less complex and expensive than that hundred-billion-dollar beast, but it'd still require a fair bit of space-based assembly, which will add to the challenge. Emrod is looking at another proposal that would place satellites in much lower orbits closer to 100 km (62 miles) – those would only need to be 30-40 m (100-130 ft) across, and thus much cheaper to build and launch. But they wouldn't transmit as far across the globe, and they'd be traveling so fast and so close to the Earth that there'd be considerable air friction to contend with. The current-gen prototype: a 1.92-metre square array

Emrod Kushnir says the company is talking to a number of aerospace companies, hoping to have its first test rigs in orbit within three years: "That'll be the first small step. Anything to do with space takes years and years. But then I think we can move much faster than the European Space Agency's roadmap. It's not going to take 20 years. Having said that, we're not waiting for that to happen. This is a commercial endeavor; the first applications are terrestrial. We're hoping to have the first commercial deployment in 2024." The biggest issues for Emrod at this stage, says Kushnir, aren't the technology at all, or even the economics. "For some reason," he says, "there's a cognitive gap for people. They have no problem believing they can pick up a phone – which uses electromagnetic waves sent via satellite – to communicate with people all over the world and send information. But it's hard for people to accept you can do the same with energy, and that in terms of the physics, it's not that different. "So we have a lot to prove. I guess, in about two years, we'll cross that Rubicon after we have the first couple of systems deployed out there commercially. Then we'll start seeing them deployed more widely. The first set of applications will be where there are bottlenecks: issues with rights of passage or permitting, or undersea cables." While exposure to long-distance energy transfer beams wouldn't likely be dangerous, Emrod says the beams can easily be partially shut down to protect birds, skydivers and the like that travel through them. From there, things could get really interesting; Kushnir says the company is at the early stages of developing a "power skin" that could turn the entire fuselage of an aircraft into a wide-angle antenna array capable of receiving power during flight, either from space-based or land-based transmitters. Such a thing could completely sidestep the energy storage issues that are putting the brakes on airline decarbonization, if Emrod could prove to aviation authorities that it was safe. The other key issue Kushnir sees coming down the pipeline is global politics. "Well, it's next-level energy infrastructure," he says. "It's gonna be highly politicized, just like GPS, or quantum computing, or any other breakthrough technology. But once you can send energy instantaneously, regardless of location, it doesn't really matter if you border a country or if it's on the other side of the world." If you have a friendly country in the right time zone, where renewable energy is being generated right when you need it, your energy supply is as secure as that relationship. If Emrod's wireless power tech never makes it into space, and the best it manages is to replace some high-voltage power lines, it'll still be a huge step forward. But considering the incredible money that's being spent on projects like the US\$22-billion Australia-Asia Power Link, which will send renewable energy from solar farms in the Australian desert all the way to Singapore via the world's longest undersea cable, the astronomical costs of wireless power satellites could start to make sense. A global wireless power grid that can efficiently link any two points on Earth – with much smaller terrestrial infrastructure, and without cutting great strips out of forests – would indeed be a game-changing leap forward in the global transition to clean energy. Cities would need far less energy storage to firm up their power grids – a huge advantage giving the coming lithium squeeze –

and colossal solar farms could make productive use of some of the most remote and barren deserts on Earth. It's a heck of an ambition, and we look forward to following Emrod's progress. Check out a video below. [Emrod's Power Beaming Technology | The Future of Energy](#) Source: Emrod

*Source: New Atlas; Via Satellite; World Economic Forum (WEF); Space.com; SpaceNews; SMH.com.au; Forbes*

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