

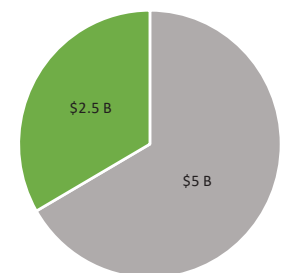
1834 - This is the year that Thomas Davenport, a Vermont native, created the first useful electric motor.¹ This may come as a shock to many because despite its early beginnings, the relevancy of electric vehicles (EVs) in society has only increased recently. EVs did not gain traction in earlier years largely due to how their bulky lead-acid batteries provided drivers with less range than petrol-powered alternatives, which was concerning due to the uncertainty of recharging resources.² However, in November of 2021 in the United States, EVs were successfully put on everyone’s radar when President Biden’s bipartisan EV infrastructure plan passed in the House of Representatives.³

The American Plan

This bill dedicated \$7.5 billion to the creation of 500,000 EV charging stations throughout the nation, and especially in low-income and rural communities.⁴ Investing in EV infrastructure is a necessity if the US is to act in consistence with the 2015 Paris Climate Accord because, on average, 54.5% of consumers require public charging in order to buy EVs and by the end of 2021, there was a concerning ratio of more than 20 EVs per charging point in the United States; to put this in perspective, there is a ratio of .0021 traditional internal combustion engine (ICE) vehicles per gas pump in the US.^{5,6,7} In this way, the bill has promoted the adoption of electric cars for everywhere and everyone, paving the way for 50% of US auto sales to be EVs by 2030 and a zero-emission future.⁸

Non-governmental organizations/companies are also helping to expand the EV charging network in the United States. For example, Tesla and Volkswagen have their own charging networks, and General Motors (GM) is now adding 2,000 DC fast chargers to its 3,250 traditional chargers that it is currently installing.⁹ These new chargers are incredibly useful since, on average, they can charge to 80% of an EV’s battery in around 20 minutes while even level 2 AC chargers – which are what most public charging stations are right now – take around 3 hours.¹⁰ GM will be building these new charging stalls along US highway truck stops and travel centers. Thus, the usefulness of DC charging capabilities will be greatly expanded for long-haul truckers and road-trippers, i.e., users who value on-the-go, speedy charging. Furthermore, the work that GM is doing benefits all EV drivers, as its charging stations can be used with any model of EVs up to 350kW charging power compatibility; Tesla charging stations, on the other hand, can only be used for Teslas.

Infrastructure Bill Fund Allocation



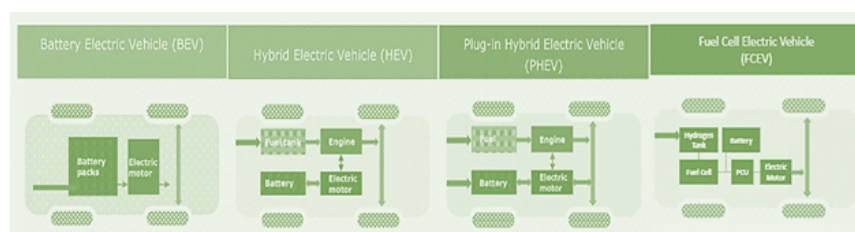
■ States ■ Disadvantaged Communities

U.S. Department of Transportation (USDOT)

The transition to EVs in the United States is not as simple as increasing accessibility to consumers. On the supply side, there has been some bumps in the road, specifically when it comes to mineral availability. Currently, China controls around 80% of the world’s processing and refining of materials such as lithium, cobalt, and nickel, all of which are necessary in creating electric car batteries.¹¹ To reduce energy dependence on competing nations, the Biden administration has recently started discussions of using \$3.1 billion to help domestic production of EV batteries. This will be necessary to not only improve material processing systems, but to also afford lithium, which has seen a 434% year-to-year price spike, and nickel which has seen more than a 14% year-to-year price spike.¹²

Okay wait – let’s go over some basics

There are essentially four types of EVs: battery electric (BEV), hybrid electric (HEV), plug-in hybrid (PHEV), and fuel cell electric (FCEV).¹³



Accelerated Mobility Revolution for India’s Transportation (AMRIT)

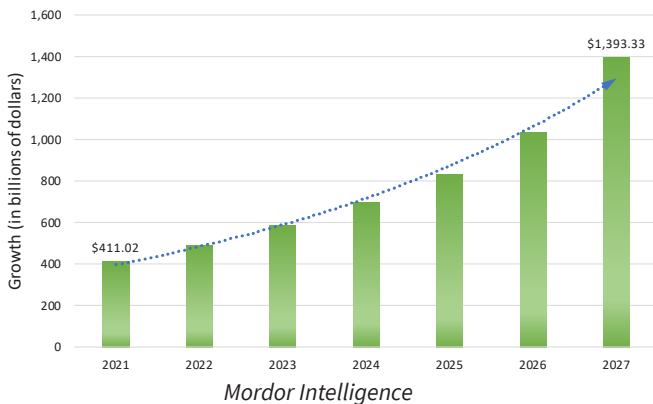
As the name insinuates, hybrid electric vehicles use both an internal combustion engine and a battery, which powers the motor and can be charged using a socket if it is a PHEV. The battery is the first source of energy for these types of cars and when they are empty, the internal combustion engines kick in. Because PHEVs use electricity to charge their batteries instead of the engine, they are more efficient than HEVs. However, BEVs are the most efficient when comparing these three types of EVs. FCEVs are a bit more complex than these other options, but they are the cleanest. By using fuel cell technology, the car itself creates electricity to power the vehicle by converting the fuel’s chemical energy into electric energy. As such, it is a true “zero-emission vehicle.” Though they are more expensive to run than a BEV right now, this relationship will reverse within the next 10 years as fuel cell system and hydrogen costs decrease and manufacturing technology improves.¹⁴ In fact, China has an even more expedited timeline with an FCEV’s total cost of ownership being lower than a BEV’s by 2028.

Unfortunately, there are costs associated with BEVs and FCEVs, despite how they are helping create a zero-emission world. Mining one ton of lithium requires around 500,000 gallons of water; the average EV battery requires 10 kg of lithium or about 5,512 gallons of water per EV.^{15, 16} Such a situation is devastating in areas of the world that have decreasing amounts of water. For example, in Salar de Atacama, Chile – a part of the Lithium Triangle in South America – loses 65% of its water due to lithium mining, forcing locals to find water elsewhere.¹⁵ To make matters worse, mining may require toxic substances such as hydrochloric acid and lithium-ion EV batteries rarely get recycled properly; both situations pose a threat to environment contamination/pollution. However, while EV batteries require more cumulative energy demand than regular car batteries, fossil fuel emissions for gas-powered cars are more than double the average of all types of electric cars.¹⁷ Moreover, the environmental cost that EVs pose is well acknowledged and trying to be solved. The future is still bright when realizing that friendlier and more accessible alternatives such as salt, iron, liquid batteries are being looked into.¹⁵

Key Players

As of 2021, the EV market was valued at \$411.02 billion with a CAGR of about 19.2% for the six-year period of 2021-27.¹⁸

Global EV Market Growth

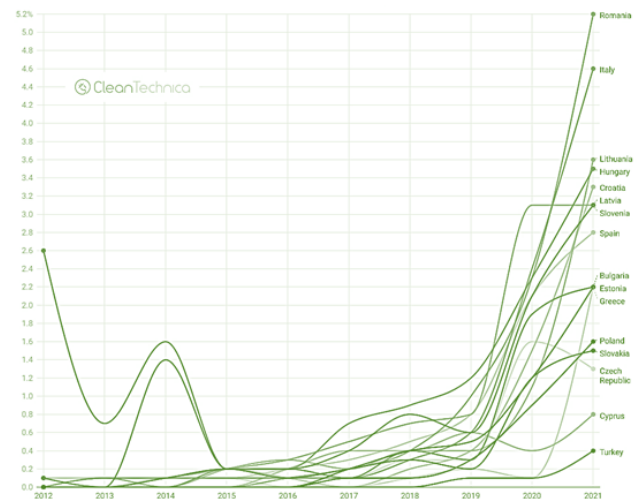


Currently, the Asia Pacific market holds the largest market share in this space and continues to outpace other regions in growth. Due to its established supply chain, consumer demand, and government support, China is the world’s largest EV producer and user.¹⁹ In fact, China made almost 90% of the world’s EVs in 2021 and exported 500,000 of them.²⁰ The Asia Pacific EV market also features prominent nations such as Japan and South Korea, with South Korea even exporting more than 300,000 EVs in 2021 and domestically selling more than 100,000. A lot of these sales were, in part, due to light truck sales. Fossil fuel trucks face great fees and restrictions so commercial EVs are in great demand.²⁰

Market Share Growth of Full Electric Vehicles in 16 European Countries

Behind China and the Asia Pacific in the adoption of EVs lies Europe. Norway is currently leading this region, as it holds 64.5% of the European market for BEVs.²¹ However, there is promising growth spreading across the entire continent, with Romania making the greatest stride in recent years.

This graph illustrates how Romania has obtained 5.2 % of the fully electric vehicle, or BEV, market – which is composed of 16 European countries – in 2021. Though Italy has the top market share when analyzing the plug-in vehicle sector, Italy is second in BEVs; however, this is only by 0.6%. Despite this, it is still clear to see that all of these countries have seen a spike in BEV sales in the past two years, allowing them to reach the level that current EV-leading European countries like Norway, Iceland, and Sweden experienced a few years earlier. If the 16 countries above follow suit, they too will see more than 10%



European Alternative Fuels Observatory (EAFO)

of new car buyers choosing BEVs soon.

The United States just recently experienced EVs being 5.6% of new car sales in Q2 of 2022.²² While the US, is still behind China and Europe, this is a major feat. This is because 5% is the point where EV sales skyrocket, as seen in Norway, China, and even South Korea. Thus, if the US follows a similar S curve EV adoption pattern, the US can have 25% of new car sales be EV by the end of 2025, giving them a bigger market share in the electric space. To give a better visual of S curve adoption here is a chart made by McKinsey & Company.²³

Though the data is outdated, the adoption pattern is accurate in that after a few years of only garnering attraction by early adopters, EV acceptance grows rapidly until the final states of the S curve.

Some key motor players in this field are Tesla, BYD, Toyota, Honda, and Volkswagen. These EV manufacturers are not popular in any one specific region but all over the world, allowing them to make a bigger impact than companies similar to Ford, which is more regional.²⁴ For example, BYD is the largest EV automaker in China, but it services all throughout the world, making it the fourth-largest EV automaker on a global scale. BYD and the other companies listed focus most on passenger cars, which have the largest share in the global EV market. As such, the manufacturers are constantly working to innovate so that consumers can get the level of personalization and variety traditional gasoline cars offer. Honda envisions itself producing 2 million EVs a year by 2030 and hopes to launch 30 EV models by the end of the decade.

To make it an even better experience for passengers, Honda is joining Sony to create a new EV company with top-of-the-line technology and electronics.²⁵ Of course, all of this comes at a cost, so it will be interesting to see how customers react to somewhat higher prices than they are used to for an average car and how manufacturers will answer. It is exciting that even car rental companies are making their mark in this new electric wave. Hertz recently announced that they are planning to buy around 65,000 EVs made by Volvo's Polestar and 100K EVs from Tesla.²⁶

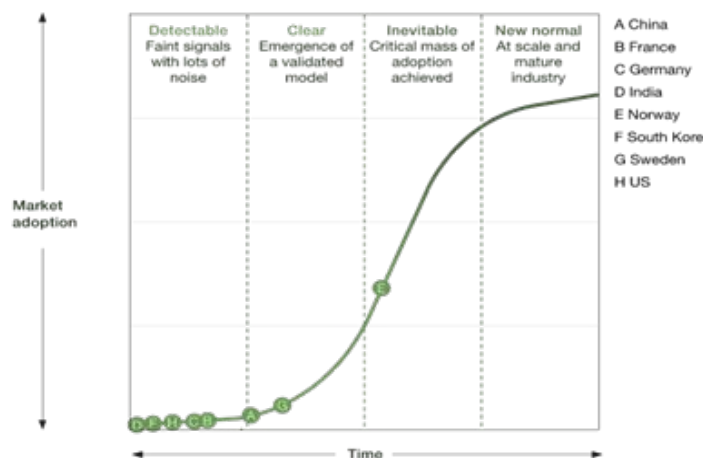
So, what about Emerging Markets?

Historically, emerging markets have taken somewhat longer to adopt new innovations that are growing elsewhere in the world. This is in part due to their lack of technology and infrastructure, but it is concerning since it will take a unanimous international effort in going electric to fight the effects of climate change. Emerging countries such as Thailand and Indonesia recognize this threat and are actively working to promote an EV future. In order to encourage EV purchases, in February of 2022, Thailand created an incentive package that included import duty reductions in a regressive manner and a cut in excise taxes for imported EVs by 6%.²⁷ Moreover, to spur domestic EV production, car and motorcycle manufacturers will receive subsidies on a per unit basis; the goal is to have 30% of all vehicles in Thailand be electric by 2030. Indonesia is also increasing its EV capacity, and its 2030 goal is to have produced 600,000 four-wheeled EVs and 2.45M two-wheeled EVs each year. Indonesia has a natural advantage when it comes to EVs.²⁷ Nickel is a key component of EV batteries and make up almost 35% of EV production costs; since Indonesia is rich in nickel, it will have much less EV manufacturing expenses as a result. In fact, LG invested \$9.8B into EV battery manufacturing in Indonesia.²⁷ Furthermore, LG is working with Hyundai to make an EV battery plant in Indonesia, where Hyundai will be the first to create EVs in the country.

It is important to note that Thailand is an established industrial producer and carmaker and Indonesia; together, these factors make these countries uniquely more fit to take on electric mobility and capitalize on it. In addition, giant automotive exporters South Africa and Morocco are also making strides in the global mission to a zero-emission future through EVs. Unfortunately, other countries in emerging markets do not share these qualities or stature, making their EV future harder to attain. On the bright side, however, the International Energy Agency expects a 1218.2% increase in the number of EVs worldwide by the end of this decade.

In Norway - which is clearly ahead of other countries - the electric-vehicle disruption is inevitable.

The 4 stages of a disruptive trend—focus on electric-vehicle market adoption



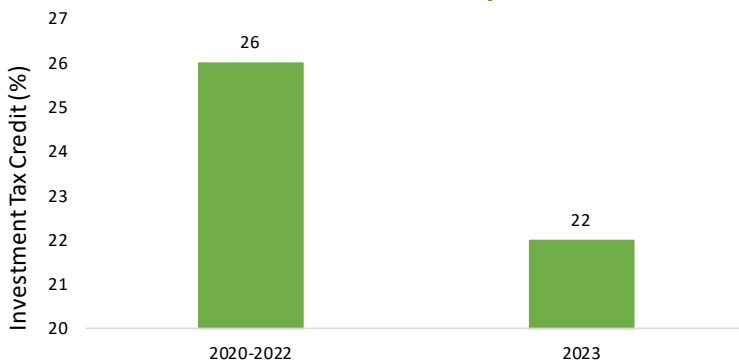
McKinsey & Company

Impact on Drivers

So, what makes an EV, an EV? The electric part, right? But why is electric attractive to a consumer, other than the fact that you would be helping out the environment, and it might feel like you are the captain of a futuristic Star Trek ship? What is in it for a regular driver?

Well, EV drivers are looking at much fewer costs as they relate to fuel and maintenance.²⁸ The fuel component is based on how recent data shows that, on average, it costs a mere \$1.41 per gallon-equivalent to drive an EV. To implement a differential diagnosis, this is 70% cheaper than the price per gallon for a traditional gasoline car!²⁹ While this is an average metric, the disparity between gas and electricity rates is greatest in Washington where EV drivers will benefit from an 81% discount in costs. Consumers need not be worried of a loss in cost savings even as electricity demand rises. To decrease the power grid from becoming overwhelmed, states are thinking to introduce time-of-use (TOU) electricity rates that incentivize charging in off-peak hours, so charging one’s car overnight could save them around 30% on that charge.^{28,30} Increased use of renewable energy can also stabilize and lower costs. Utility companies that get a lot of their electricity from hydroelectric dams, wind turbines, and solar panels enable their state rates to fall below the national average.³¹ Consumers can even increase their savings by installing residential solar systems, since installation receives more than a 20% tax credit in most states until 2024, and charging thereafter is essentially free.³²

Tax Credit for Residential Solar System Installations



The Office of Energy Efficiency & Renewable Energy

From a maintenance perspective, annual maintenance costs for an EV are also between 10 and 25 percent lower than for their gas-powered peers.²⁸ This is the natural result of EVs having regenerative braking and fewer internal parts.

Another financial benefit of having electric vehicles actually comes from the US Government. If a consumer purchases an EV from a company that has sold less than 200,000 EVs, they are entitled up to a \$7,500 federal tax credit. Such a credit can ease a buyer’s cost of entry because although moderately priced EVs cost \$27,400 to \$34,000, the average EV today is \$54,000 upfront due to increased demand.³³

Impact on the Economy

EVs sound like a pretty sweet deal for an individual consumer, huh? We would be remiss, however, if we did not consider the effect on the economy as a whole.

For one, the economies would be positively impacted by consumer savings – derived from fewer costs associated with owning an EV – being reinvested into them. This economic stimulation would allow for job creation; more payrolls could be afforded. Jobs will also be created through the establishment of EV infrastructure. Building charging stations requires electricians, general contracting, planners, and designers.³⁴ These stations will then need to be repaired/maintained by other electrical workers, and of course, administrative and legal staff will also be required. When considering the current Administrations goal of establishing 500,000 EV stations throughout the nation, assuming these are DC fast chargers, 28,950 job-years could be created from these aforementioned jobs.³⁴ Even more jobs, such as retail, will also be created when accounting for how drivers need a pastime when waiting for their cars to charge. However, this could be seen in a negative light as there is already a disproportionate amount of job openings to job takers in the national labor market. If the gap between labor demand and supply continues to widen, the need for employees may create upward pressure for greater wage inflation, exacerbating current inflationary conditions.

Going electric can also decrease the nation’s oil dependency. Gas consumption has already decreased to 9 million barrels per day in 2H22. With a 2% increase in overall fleet fuel efficiency during this period, gasoline consumption growth has faltered further. As such, the increase in EV technology will create less of a need to import oil into the country. With decreased oil dependence on Canada, Mexico, Russia, Saudi Arabia, and Colombia, the US will be less vulnerable to instabilities in these said nations.³⁵ This is a favorable byproduct of EVs because domestic consumers were hit hard by high gasoline prices earlier this year due to the Russia-Ukraine war. In addition, similar to how the transition to electricity will allow energy dollars to stay within US borders, internal states that outsource oil for transportation consumption – like Nevada – can also save energy dollars and stimulate their economies.²⁸ State electricity rates will experience a downward pressure as EV charging shifts to off-peak demand periods. All electricity consumers in a state

– even non-EV owners – will be able to reap these savings from increased efficiency.

Future Implications

At this time, Europe is “expected to be the first region with plans to fully shift to EVs.”¹⁹ This is because the majority of countries in this region have said they will stop the sales of ICE cars in the next few decades. While the UK wants to have its vehicle market to have mostly EV sales by 2030, Norway wants to the same but by as soon as 2025. In the Asia Pacific, China and Japan have a slightly extended timeline but still plan to stop ICE sales by 2035. Moreover, China is working to fully ban diesel and petrol transportation by 2040.¹⁸

In addition, when considering the emerging world of autonomous vehicles (AVs), it seems that the car industry as we know it has been changed forever. There are already two big names in this space: GM-backed Cruise and Alphabet’s Waymo. At the end March of 2022, Waymo finally started to let its AV fleet fully loose – meaning with no driver supervision – in the streets of San Francisco.³⁶ Although this service was only open to Waymo employees from 10 A.M. to 5 P.M., it was still a big feat for the company that eventually wants a comprehensive robotaxi operation open to all and in complex locations. Of course, however, Cruise already secured a robotaxi permit for a large US city in February of 2022, allowing the company to offer fully AV rides to any passenger. More recently – in June – Cruise has even gotten the approval to now start charging its customers.³⁷ For Cruise alone, there are expectancies of having more than one million AVs manufactured and \$50 billion in revenues in 2030.

With such movement in the transportation space, it seems that the end of ICE vehicle sales is near and will be universal. It is not a stretch to predict that other governments may follow in China’s footsteps and eventually stop allowing the use of ICE vehicles. However, what does this mean for consumers who love a traditional car, the sound of a roaring engine, the ability to control it themselves, and want an interface that is not inundated with touchscreens and apps aplenty? Similarly, what happens to traditional Ubers and Uber drivers with the onset of robotaxis? Only time will tell. Until then, continue trusting Regions to keep you in the know and in the now.

References:

¹ CNN: <https://www.cnn.com/interactive/2019/07/business/electric-car-timeline/index.html>

² CNET: <https://www.cnet.com/roadshow/news/biden-bipartisan-infrastructure-bill-ev-charging-us-house/>

³ The Guardian: <https://www.theguardian.com/technology/2021/aug/03/lost-history-electric-car-future-transport>

⁴ U.S. Department of Transportation: <https://www.transportation.gov/briefing-room/president-biden-us-department-transportation-releases-toolkit-help-rural-communities>

⁵ JPMorgan, Alix Partners: <https://www.alixpartners.com/media-center/press-releases/the-alixpartners-2021-electric-vehicles-consumer-sentiment-survey/>

⁶ JPMorgan, Bloomberg Finance L.P.NEF

⁷ Jerry Insurance Agency: <https://getjerry.com/studies/number-of-u-s-ev-charging-ports-will-soon-surpass-gas-stations>

⁸ CNBC: <https://www.cnbc.com/2021/08/05/biden-pushes-for-evs-to-make-up-40percent-or-more-of-us-auto-sales-by-2030.html>

⁹ The Verge: <https://www.theverge.com/2022/7/14/23207519/gm-ev-charging-stations-pilot-flying-j-evgo>

¹⁰ Charge Point: https://www.chargepoint.com/files/Quick_Guide_to_Fast_Charging.pdf

¹¹ The New York Times: <https://www.nytimes.com/2022/05/02/climate/biden-electric-car-batteries.html>

¹² Trading Economics: <https://tradingeconomics.com/commodities>

¹³ AMRIT: <https://e-amrit.niti.gov.in/types-of-electric-vehicles>

¹⁴ Deloitte: <https://www2.deloitte.com/cn/en/pages/about-deloitte/articles/pr-fcevs-to-be-cheaper-to-run-than-bevs-and-ice-vehicles-within-10-years.html>

¹⁵ Motor Biscuit: <https://www.motorbiscuit.com/ev-car-batteries-destroy-environment-violate-human-rights/>

¹⁶ Quartz: <https://qz.com/2156463/why-elon-musk-wants-tesla-to-start-mining-lithium/>

¹⁷ Climate 360 News: <https://climate360news.lmu.edu/lithium-not-as-clean-as-we-thought/>

¹⁸ Mordor Intelligence: <https://www.mordorintelligence.com/industry-reports/electric-vehicle-market>

¹⁹ Markets and Markets: [https://www.marketsandmarkets.com/Market-Reports/electric-vehicle-market-209371461.html#:~:text=Components%2C%20Vehicle%20Type%2C%20Vehicle%20Class,End%20Use%2C%20Propulsion%20and%20Region.&text=Tesla%20\(US\)%2C%20Volkswagen%20AG,company%20profiles%20covered%20and%20provided](https://www.marketsandmarkets.com/Market-Reports/electric-vehicle-market-209371461.html#:~:text=Components%2C%20Vehicle%20Type%2C%20Vehicle%20Class,End%20Use%2C%20Propulsion%20and%20Region.&text=Tesla%20(US)%2C%20Volkswagen%20AG,company%20profiles%20covered%20and%20provided)

²⁰ Clean Technica: <https://cleantechnica.com/2022/05/06/2021s-top-3-countries-in-the-global-ev-revolution-part-2/>

²¹ Clean Technica: <https://cleantechnica.com/2022/06/25/ev-market-share-growth-in-16-lagging-european-countries/>

²² Morning Brew: https://www.morningbrew.com/daily/stories/2022/07/14/electric-vehicles-hit-5-of-new-cars-sold-in-the-us?utm_campaign=mb&utm_medium=newsletter&utm_source=morning_brew&mid=e44bfdc2e23c3ccd62a194617385bb8c

²³ McKinsey & Company: <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/the-global-electric-vehicle-market-is-amped-up-and-on-the-rise>

²⁴ Yahoo: <https://www.yahoo.com/now/global-electric-vehicle-market-size-112900413.html#:~:text=GlobeNewswire,The%20global%20electric%20vehicle%20market%20size%20is%20projected%20to%20reach,at%20a%20CAGR%20of%2021.7%25>

²⁵ Tech Crunch: <https://techcrunch.com/2022/04/11/honda-to-launch-30-ev-models-by-2030/>

²⁶ The Verge: <https://www.theverge.com/2022/4/4/23009781/hertz-polestar-ev-purchase-car-rental-deal>

²⁷ The Oxford Business Group: <https://oxfordbusinessgroup.com/news/which-emerging-markets-are-looking-bolster-electric-vehicle-production>

²⁸ Southwest Energy Efficiency Project: <http://www.swenergy.org/pubs/economic-and-emissions-benefits-of-electric-vehicles-in-nevada>

²⁹ Yale Climate Connections: <https://yaleclimateconnections.org/2022/06/driving-with-electricity-is-much-cheaper-than-with-gasoline/>

³⁰ Natural Resources Defense Council: <https://www.nrdc.org/stories/electric-vs-gas-it-cheaper-drive-ev>

³¹ The New York Times: <https://www.nytimes.com/2022/05/03/business/energy-environment/high-electric-bills-summer.html>

³² The Office of Energy Efficiency & Renewable Energy: <https://www.energy.gov/eere/solar/homeowners-guide-federal-tax-credit-solar-photovoltaics#:~:text=In%20December%202020%2C%20Congress%20passed,2024%20unless%20Congress%20renews%20it.>

³³ Inside EVs: <https://insideevs.com/news/595203/electric-car-prices-rising-demand-material-cost/>

³⁴ GreenBiz: <https://www.greenbiz.com/article/how-ev-charging-build-out-can-create-good-jobs>

³⁵ EIA: <https://www.eia.gov/tools/faqs/faq.php?id=727&t=6#:~:text=The%20top%20five%20source%20countries,%2C%20Saudi%20Arabia%2C%20and%20Colombia>

³⁶ Wall Street Journal What's News: <https://www.wsj.com/podcasts/google-news-update/driverless-cars-finally-start-losing-the-drivers/80d35972-0d57-440f-bd8a-c89bb3cf82b6>

³⁷ Financial Times: <https://www.ft.com/content/2bde3e7f-b91d-49d7-bbaf-898f39db6263>

The content and any portion of this newsletter is for personal use only and may not be reprinted, sold or redistributed without the written consent of Regions Bank. Regions, the Regions logo and other Regions marks are trademarks of Regions Bank. The names and marks of other companies or their services or products may be the trademarks of their owners and are used only to identify such companies or their services or products and not to indicate endorsement or sponsorship of Regions or its services or products. The information and material contained herein is provided solely for general information purposes. Regions does not make any warranty or representation relating to the accuracy, completeness, or timeliness of any information contained in the newsletter and shall not be liable for any damages of any kind relating to such information nor as to the legal, regulatory, financial or tax implications of the matters referred herein. This material is not intended to be investment advice nor is this information intended as an offer or solicitation for the purchase or sale of any security or other financial instrument. Any opinions expressed herein are given in good faith, are subject to change without notice, and are only current as of the stated date of their issue. Regions Asset Management is a business group within Regions Bank that provides investment management services to customers of Regions Bank.

Employees of Regions Asset Management may have positions in securities or their derivatives that may be mentioned in this report or in their personal accounts. Additionally, affiliated companies may hold positions in the mentioned companies in their portfolios or strategies. The companies mentioned specifically are sample companies, noted for illustrative purposes only. The mention of the companies should not be construed as a recommendation to buy, hold or sell positions in your investment portfolio.

Neither Regions Bank nor Regions Asset Management (collectively, "Regions") are registered municipal advisors nor provide advice to municipal entities or obligated persons with respect to municipal financial products or the issuance of municipal securities (including regarding the structure, timing, terms and similar matters concerning municipal financial products or municipal securities issuances) or engage in the solicitation of municipal entities or obligated persons for such services. With respect to this presentation and any other information, materials or communications provided by Regions, (a) Regions is not recommending an action to any municipal entity or obligated person, (b) Regions is not acting as an advisor to any municipal entity or obligated person and does not owe a fiduciary duty pursuant to Section 15B of the Securities Exchange Act of 1934 to any municipal entity or obligated person with respect to such presentation, information, materials or communications, © Regions is acting for its own interests, and (d) you should discuss this presentation and any such other information, materials or communications with any and all internal and external advisors and experts that you deem appropriate before acting on this presentation or any such other information, materials or communications.

Investment, Insurance and Annuity Products

Are Not FDIC-Insured | Are Not Bank Guaranteed | May Lose Value | Are Not Deposits

Are Not Insured by Any Federal Government Agency | Are Not a Condition of Any Banking Activity