

BEFORE THE ENERGY AND PUBLIC UTILITIES COMMITTEE THE OHIO SENATE SENATOR ROB McCOLLEY, CHAIR

SENATE BILL 307 TESTIMONY OF JOHN A. SERYAK RUNNERSTONE, LLC ENERGY ENGINEER TO THE OHIO MANUFACTURERS' ASSOCIATION

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Chairman McColley, Vice Chairman Schuring, Ranking Member Martin, and members of the Senate Energy and Public Utilities Committee, thank you for the opportunity to provide testimony today on Senate Bill 307.

My name is John Seryak, and I am the founder of Runnerstone, an energy consultancy providing accurate, unbiased information on energy policy, regulations, and market matters. I am also founder of its affiliate, Go Sustainable Energy, which provides accurate, unbiased information on energy efficiency, distributed energy, and energy management to energy using customers and utilities. I serve as the energy engineer to both The Ohio Manufacturers' Association (OMA) and the OMA Energy Group, and it is on the OMA's behalf that I testify today.

I'd like of share with you some of my experience with electric vehicle (EV) and EV charger adoption. As one of the largest energy consultancies in Ohio, our firm works with companies and electric utilities on a regular basis on matters such planning fleet electrification and integrating EV chargers into their facilities and systems. We are on the front lines of EV adoption challenges. We are already fielding calls from customers on their EV charging station interconnection or billing issues. We are also nationally recognized for EV planning. A sustainability plan we developed for the Central Ohio Transit Agency, which included a plan to transition to 100% electric coaches, was recognized as the "Champion of the Challenge" by the US Department of Transportation, Federal Transit Administration. We expect the trend of increasing EV adoption to impact how manufacturers use electricity, in addition to impacting the parts and products they manufacture.

Ohio's powerhouse automotive industry is pivoting to adapt to new demands in vehicle manufacturing, whether through the development of new EV models or collaborations to produce the next generation of battery cells. Transitioning to EV manufacturing is creating billions of dollars in capital investment in Ohio. But the rapid shift to EV manufacturing and adoption does not come risk free – now is the time to responsibly consider how the breadth of our manufacturing sector will respond to the EV transition, to consider the changing environmental and national security impacts, and to ensure EV adoption makes our electric grid more competitive and resilient, while constraining electricity costs. There is work

to do. I've attached with my testimony a primer on the opportunities and challenges for Ohio with the EV transition from the OMA.

With EVs driving innovation in automotive manufacturing, elements of Senate Bill 307 will help position Ohio to retain its dominant role in the automotive industry. By providing funding for retooling factories and retraining the workforce, Ohio would signal its support for the growth of not only electric vehicles, but the entire supply chain. Additionally, this bill would establish an ongoing task force to better diagnose EV industry needs, while adopting state policies and laws to help ensure long-term industry success.

However, we have serious concerns with provisions that would also expand the role of Ohio's regulated utilities in a costly way that does not provide clear benefits to customers, or the EV industry. In fact, these provisions would likely hinder EV adoption. The creation of the Transportation Electrification Program (TEP) in Senate Bill 307 would create a new source of profit for Ohio's monopoly electric distribution companies, thereby thwarting existing and emerging competitive markets. This provision would expose customers to new costs from the riders that would likely result in overbuilding the electric grid in the name of EVs – all without establishing an actual need to build more capacity. In effect, this makes EV adoption more expensive and slows the transition - it forces EV deployment to wait on the utility to build wires we may not even need.

Three electricity policy issues should be carefully considered with EV adoption:

- Does EV adoption require an electric grid upgrade? In many cases it will not. But the Transportation Electrification Program can assume any EV adoption, or even the spectre of adoption, requires a grid upgrade. Keep in mind most EVs will charge off peak, at times when there is by definition extra capacity on the existing electric grid.
- In the case of a needed grid upgrade, do utilities need new law to recover costs? The answer is no. It is already commonplace for new electric load to be added to our electric grid, and there are existing processes in place to approved upgrades and cost recovery for those upgrades by the utility.
- 3. Do utilities need to own competitive products? The answer is no. Certainly, utilities should not be allowed to own and operate EV charging stations, which are already a competitive product and business sector. Additionally,

certain other competitive products – namely batteries and distributed generation (ex. Solar) – can be part of "infrastructure" at an EV charging station. Ohio's policymakers should be mindful that competitive businesses and products can now be interconnected directly to the electric distribution grid. There is no need to grant a monopoly franchise over emerging competitive businesses.

As I mentioned, there is work to be done to prepare Ohio's electric grid for EV adoption. We recommend policymakers consider the following alternate electricity policies to speed EV adoption, constrain costs, and improve reliability:

- Smart charging rates OMA supports requiring electric utilities to create electricity rates that encourage off-peak charging. For example, most electric circuits have a peak hour(s), like a "rush hour" of electricity. Costly grid upgrades can be avoided by ensuring EVs charge off this peak at times of low electricity use.
- Power capacity maps OMA's supports requiring utilities to publish publicly available data of its lines' rated power capacities, the peak power use and time of use on these lines, and the typical off-peak power use and times. The concept is simple – a color-coded map of electric lines that show which have available power capacity (green) and which would need upgrades (red), for on and off-peak times. Many states already require this of their utilities. This would allow EV charging businesses to locate on circuits that do not require costly and time consuming upgrades.

The policy suggestions we offer here create transparency into whether and where the grid needs upgraded, it lowers costs by allowing EV charging to locate on circuits with existing capacity avoiding construction cost and time delays, it improves reliability by charging off-peak, and it protects competition from monopolies.

Ohio manufacturers consume nearly a third of all energy resources in our state. Public policies that impact the cost of electricity are of great interest to the OMA. We must ensure that Ohio continues to have a robust auto industry, but not at the expense of market economics and captive customers. We respectfully request that the committee remove Transportation Electrification Plans from Senate Bill 307, and instead adopt language requiring smart charging rates and power capacity maps. Thank you, Mr. Chairman, and members of the committee for the opportunity to provide testimony on Senate Bill 307. I am happy to answer any questions.



To: The Ohio Manufacturers' Association From: John A Seryak, PE (Runnerstone)

Senate Bill 307 - Electric Vehicle Charging Cost, Competitiveness, and Reliability Implications

Key Points

- Senate Bill 307 has three contentious electric policy concepts: whether the addition of electric vehicle charging stations require electric grid upgrades, whether utilities need new law to recover costs of grid upgrades associated with electric vehicle charging, and whether utilities should or need to own competitive products.
- Electric infrastructure upgrades: OMA proposed language requires the creation of a grid capacity map to determine where the electric grid is in need of infrastructure upgrades in order to add load to the system; the proposed utility language does nothing to determine which parts of the electric grid actually need upgrades.
- Utility cost recovery: OMA proposed language relies on existing law for needed utility cost recovery; the proposed utility language creates new law to recover costs from customers with no demonstration of need. Utility supported provisions could create tens of hundreds of millions of dollars in additional costs per year to customers.
- Competitive products: OMA proposed language protects competitive markets; the utility proposed language creates or encourages rate-subsidized utility-ownership of competitive products.

Senate Bill 307 (SB307) has been introduced in the 134th Ohio General Assembly to support electric vehicle (EV) deployment throughout Ohio, including through the creation of an automotive industry task force, a sales tax exemption for EVs, and changes to the state's electricity laws, among other provisions. SB307's changes to the state's tax and electricity laws should be of concern to manufacturers. The introduced bill could result in significant, potentially unfettered utility spending on unneeded infrastructure, resulting in higher electricity costs to manufacturers with no commensurate benefit.

At contention is whether utility grid infrastructure changes are needed to accommodate EV adoption, whether the utilities need new law to recover costs for these upgrades, and whether utilities should be allowed to own competitive products, such as EV charging stations and batteries.



Is new electric grid infrastructure needed?

Manufacturers and policymakers should know that Ohio's electric distribution grid can already accommodate EV charging, even at peak times, on many electric circuits. Circuits with ample capacity would not need infrastructure upgrades. Moreover, EVs can be encouraged to charge off-peak when even more distribution grid capacity is available. Thus, if managed smartly, in most cases EV charging would result in better utilization of existing grid infrastructure, rather than the need for more grid infrastructure.

While some electric circuits may need upgraded, in many cases EV adoption could be accommodated with today's electric distribution grid capacity. What is not known currently is how many EV charging stations can be accommodated on a given circuit when utilizing off-peak charging. This critical information is missing from the policy discussion on EV charging and electric infrastructure needs.

What do manufacturers suggest?

The Ohio Manufacturers' Association (OMA) is recommending two solutions to help policymakers and businesses determine how much new electric grid infrastructure is needed:

- Power capacity maps OMA's proposed language would require the electric utilities to make publicly available distribution circuit peak power hosting capacity maps. While the name "distribution circuit peak power hosting capacity map" is complex, the concept is simple: it is a color-coded map of electric lines that show which have available power capacity (green) and which don't and may need upgrades (red). These maps achieve the following:
 - Transparency: customers, EV businesses, and regulators can all readily see which circuits have plentiful charging capacity and do not need upgraded. Many states already require their utilities to post such maps on their website this information is not a trade secret but is of the public interest.
 - Lower costs: EV charging businesses would be attracted to locating on circuits which do not require costly upgrades, allowing development of charging stations at a lower cost.
 - Speedier EV adoption: EV businesses that locate on circuits with available capacity save time in addition to money, as they do not have to wait on the utility to make time intensive upgrades. Electric grid upgrades could take months or years, significantly bottlenecking EV charger deployment.
 - Improves reliability: EV charging businesses would naturally gravitate to circuits that have ample capacity, and would pose less risk to overloading circuits at peak times.
 - Protects competition from monopolies: utilities would not be able to withhold circuit information for leverage on competitive businesses, which is currently the case.
- Smart charging electric rates OMA's proposed language would require the electric utilities to create electricity rates that encourage off-peak charging of EVs. EV charging technology has the promise of being able to charge an EV at off peak times, that is, when electricity use is lowest during the day and typically cheaper. For example, most electric circuits have a peak hour(s), like a "rush hour" of electricity. Costly grid upgrades can be avoided by ensuring EVs charge off-peak at night and other times of low electricity use. A smart charging rate achieves the following:



- Transparency: customers and EV businesses would see which hours of the day are the least costly to charge the EV.
- Lower costs: armed with information on how to lower their charging costs, businesses and customers would be attracted to saving money by charging EVs when electricity is cheap, instead of when it is expensive.
- Speedier EV adoption: Lowering the cost of electricity for EV charging is like lowering gas prices for internal combustion engines it will encourage adoption of EVs.
- Improves reliability: EV charging would naturally gravitate to charging at times when electric circuits are underloaded, and thus reduce risk of overloading circuits at peak times.
- Protects competition from monopolies: utilities would not be able to "hide the ball" on prices by charging low rates during peak periods. Utilities have a natural incentive to load circuits up on their peaks, as this would lead to utility spending to upgrade lines and utility profits.

What do the utilities suggest?

Utilities are proposing that new law be created to give them more powers and create new costs. The proposed utility provisions:

- Fail to require a demonstration of need prior to completing costly infrastructure upgrades,
- Fail to offer a way in which infrastructure needs can be evaluated, and
- Fail to require off-peak charging to minimize the risk of overloading the grid during peak times, and
- Creates a presumption of need.

Dangerously, the utility provisions allow "make ready" investments, which means the utility can over-build infrastructure whether EV charging is going to occur on a particular circuit.

Do utilities need a new law to recover costs to accommodate new electric loads?

No, utilities do not need new law to recover costs to accommodate new electric loads such as EV charging stations. For example, many EV charging stations have already been installed in Ohio under existing laws and regulations. Moreover, utilities regularly accommodate new electric loads that require grid infrastructure upgrades. This includes new manufacturing production lines, new homes, new buildings, etc. The electric grid is not static and unchanging, it is dynamic. Electric utilities regularly make upgrades and changes to the grid based on changing customer needs, and already collect billions of dollars per year to maintain and update the electric grid. In this way, EV charging is no different than other new business developments.

What do manufacturers suggest?

Manufacturers do not think utilities need new law to recover costs for electric grid infrastructure improvements. Utilities already collect billions of dollars each year to maintain and upgrade the electric



grid. Utilities have existing legal authority and regulatory processes to make necessary grid upgrades when new electric load is added to a circuit. When it comes to infrastructure upgrades, there is no clear reason to treat new EV charging stations differently than, say, electric load for a new manufacturing production line.

What do utilities suggest?

Utilities are requesting new spending powers through the approval of a "transportation electrification program." SB 307 allows for cost recovery of "electric vehicle charging infrastructure," yet is silent on how this infrastructure is different from existing utility-owned infrastructure. Utilities already have law that enables them to upgrade the electric grid and recover costs of doing so. The need for new law suggests utilities would like to recover costs for new products or recover costs of standard utility infrastructure for new reasons or no reason at all. The utility provisions include "make ready" spending, which could result in significant costs to build out electrical infrastructure whether or not EV charging is located on the circuit.

Do utilities need to own competitive products, like EV charging stations and batteries?

No. Certain provisions of SB307 could allow utilities to own EV charging stations and other emerging competitive products, such as batteries, by calling them utility "infrastructure". While these new technologies are certainly going to be part of the electric system, and thus part of its infrastructure, they are currently part of a competitive market and do not need to be owned by utilities. That is, private capital investment can be used to fund these product installations and these companies can compete for their customers. There is not a clear need that customers should fund electric utilities - a government-franchised monopoly - to profit on these new technologies over competitive providers.

What do manufacturers suggest?

Manufacturers oppose and existing laws prohibit public utilities from owning products or delivering services that are part of competitive markets.

What do utilities suggest?

Utilities have proposed new law to allow them to own competitive products and services. Proposed language broadly includes competitive products as "infrastructure" they can own. This includes:

- EV charging stations As introduced, SB307 quite clearly creates a pathway for "utility-owned electric vehicle charging infrastructure." An amendment removes this phrase, but notably did not bar utilities from owning EV chargers.
 - Additionally, the amended bill, even with the deletion would allow utilities to recover costs of any EV charging stations from all customers, whereas today the cost of an EV charging station is borne by a competitive business. This is a significant expansion of costs utilities pay recover from customers.
- Batteries SB 307 allows for cost recovery of "electric vehicle charging infrastructure," yet is silent on how this infrastructure is different from existing utility-owned infrastructure. One new type of



equipment that would likely be included in electric vehicle charging infrastructure is a battery. Because electric vehicle charging will be intermittent but have high power requirements, it may make sense in some cases to install a battery with the charging stations to limit the cost of line capacity upgrades and wholesale market power costs. At issue then is who will own the battery. Under SB 307, if electric utilities are allowed to own batteries the battery cost would be paid for through captive customers' rates. This contradicts Ohio's policy of supporting competitive electric markets, which should include batteries.

Conclusion

The OMA proposed SB307 sub bill (I_134_2951) creates a way to determine if and where electric grid infrastructure has limited capacity, relies on existing law to approve spending that is needed, and does not allow monopoly utility franchises to charge customers to compete with competitive businesses. It additionally uses grid capacity maps and smart charging rates to create transparency, which can guide investment of EVs charging infrastructure to the least cost locations and incent charging of EVs during periods where the costs are the lowest. These provisions protect competition, minimize costs, promote reliability, and thus speed the adoption of EV charging infrastructure as compared to utility proposed versions of SB307.

	Manufacturer Proposed Sub	
	Bill I_134_2951	Utility Supported Language
Determines electric grid		
capacity	\checkmark	Х
Protects competition	\checkmark	Х
Minimizes costs	\checkmark	Х
Promotes reliability	\checkmark	Х
Speeds EV adoption	\checkmark	Х
Promotes transparency	\checkmark	X

Table 1: Effect Comparison of Proposed S.B. 307 Amendments



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OUR TAKE ON ISSUES AFFECTING OHIO'S COMPETITIVENESS

NOVEMBER 2022

Ohio's EV Transition: Examining the Opportunities and Challenges

In October 2022, Honda and LG Energy Solution announced their joint venture had selected Fayette County to build a <u>new \$3.5 billion facility</u> where electric vehicle (EV) batteries will be manufactured to power Honda and Acura automobiles. The project is expected to create 2,200 new jobs.

Honda further announced it plans to invest \$700 million to retool existing Ohio facilities to advance its vision of a fully electrified future.

This news came on the heels of earlier EV-related Ohio investment announcements by other legacy automakers. In total, Ford says it will spend <u>\$22 billion</u> through 2025 on EVs, while GM says it will spend <u>\$35 billion</u>.

To help shed light on the EV transition, The Ohio Manufacturers' Association is providing this analysis of how the industry might affect Ohio's economy, manufacturing sector, and workforce, as well as our nation's energy security and natural resources.



Background

Electric vehicles and internal combustion engine (ICE) vehicles have competed since the advent of the automobile. In 1900, <u>one-third</u> of all U.S. cars were EVs, but Henry Ford's Model T and its affordability ensured ICEs would be the preferred power source for decades to come. While interest in EVs was revived briefly during the Arab oil embargo of the 1970s, it faded when gas prices normalized.





Since the 1990s, concerns about greenhouse gas (GHG) emissions have accelerated, spurring more regulatory action by Congress and state governments. These developments have sustained interest in EVs.

In recent years, hybrid gas/battery vehicles and EVs have been introduced by legacy automakers as well as start-ups. And nearly all major auto companies have pledged to phase down or eliminate ICE vehicles in coming years.



Ohio and EVs: Impact and Opportunity

Ohio produces more auto parts than any other state. The Buckeye State assembles more cars than any other state except Michigan.

Transportation-equipment manufacturing (NAICS 336) is Ohio's largest manufacturing sub-sector by employment with 114,578 employees as of 2021 – roughly 17% of Ohio's total manufacturing workforce. Of Ohio's 15 largest employers, <u>four</u> are in the motor vehicle sector: Honda, Ford, Stellantis, and GM. Together, these companies employed 32,000 Ohioans as of 2021.

Given the importance of auto-related manufacturing to Ohio's economy, a shift from ICE vehicles to EVs could transform Ohio's manufacturing sector and economy in lasting ways.

EVs Have Fewer and Different Parts: The future size and prosperity of Ohio's auto parts sector could be significantly impacted by the fact that EVs require fewer parts than ICE vehicles. <u>Automotive News</u> reported in February 2022 that "nearly 100 traditional ICE components will be eliminated in the shift to EVs, and only a handful will survive the transition unaltered."

- Engines: Electric motors have fewer moving parts than ICEs since they do not need to fuel, initiate, and regulate combustion, or transfer and manage power to a drivetrain.
- **Transmissions:** Electric motors can achieve extremely high revolutions without the use of the variable gears found in conventional ICE vehicle transmissions. For example, Tesla vehicles are single-speed and essentially do not have transmissions. The company claims that its entire drivetrain has fewer than <u>20 parts</u>.
- Other Components: EVs' use of batteries eliminates their need for fuel systems, exhaust pipes and mufflers, and engine cooling systems.





New Opportunities: EVs, however, require approximately <u>41 components</u> that ICE vehicles do not, including electric motors, battery packs, extensive high-voltage wiring systems, charging ports and inverters, and power control units. As a consequence, the global EV battery market, currently dominated by Asia, is expected to grow to <u>more than \$95 billion</u> by 2028, according to Exactitude Consultancy, a UK research firm.

The extent to which automakers begin to produce these new EV components in new or existing Ohio facilities will determine the impact of the EV revolution on the state's economy.

Some of this transition is already happening. In addition to the announcement of the forthcoming Honda/LG battery plant, the following developments have occurred:

- GM recently <u>announced</u> it will begin making EV propulsion units alongside ICE vehicle transmissions at its Toledo facility, investing \$760 million.
- In June 2022, Ford announced an EV-related \$1.5 billion investment in Lorain County, creating 1,800 new jobs.
- Efforts continue to build EVs at GM's former Lordstown facility, while GM and LG Chem have spent more than \$2 billion to build the <u>Ultium Cells</u> battery plant, also in Lordstown.
- Cirba Solutions' battery recycling plant in Lancaster is receiving a <u>\$75 million federal grant</u> for an expansion that, once completed, will produce enough raw materials to power more than 200,000 new EVs annually.

Even manufacturers that traditionally have had no ties to the EV industry are part of this transition. For example, Lincoln Electric in Cleveland plans to design and manufacture Level 3 chargers, which can charge EVs in about 30 minutes.

Bottom Line: Although changes in the scope and complexity of EV manufacturing will bring change, neither adversity nor decline is expected in the industry. Automakers' continued adaptation and expansion of their current Ohio facilities and workforces is a positive development. It will be incumbent upon our state's auto sector stakeholders — OEMs, suppliers, labor, government, education, trade groups, and others — to support and grow the investment, jobs, and overall presence of this vital and legacy industry.

The EV Workforce: A Potentially Mixed Future?

That Ohio is already home to many new, EV-connected projects is due to predictable factors: the state's large number of OEM and supplier manufacturing facilities; proximity to large auto manufacturing centers in nearby states; the critical mass of its supplier network; and a large, skilled workforce.

But with EVs requiring many fewer parts than ICE vehicles, it begs the question: Will Ohio's future auto-related workforce be able to grow or be sustained?

Getting Ready: To ensure the workforce is prepared to adapt, the OMA is partnering with the DeWine-Husted administration, Drive Ohio, and JobsOhio to assess the EV industry's workforce needs. This partnership will work with Ohio's training and education institutions to help develop the talent and skills required for the industry's continued success.

While many of the skills for EV manufacturing readily transfer from ICE vehicle and other manufacturing, the EV industry is still fluid. Therefore, vigilance and agility are essential to ensure Ohio's workforce remains a difference maker for the state.

Bottom Line: Ohio's skilled workforce and strong manufacturing talent development system are resources that must be assertively leveraged to attract as many new EV projects as possible. Attracting a growing number of facilities will help ensure that Ohio and its manufacturing sector preserve and grow jobs as they navigate the EV transition.





EVs' Environmental Impact

Air Emissions and Carbon Impact: Unlike ICE vehicles, EVs produce no direct air emissions. They are charged through the electric grid.

Studies have found that while the production of an EV is more carbon intense than an ICE counterpart, this imbalance is reversed as the vehicle is driven. According to a University of Michigan <u>study</u> (with a grant from the Ford Motor Company), the pollution equation evens out between 1.4 to 1.5 years for sedans, 1.6 to 1.9 years for SUVs, and about 1.6 years for pickup trucks, based on the average number of vehicle miles traveled in the U.S.

The University of Michigan study found that emissions from EV sedans were 35% of the emissions from an ICE sedan, on average. These results vary based on how much GHG is created through the generation of the electricity needed to charge the EV. The greater the use of renewable sources – such as wind, solar, nuclear, and hydropower – the greater the reduction in emissions. In 2021, Ohio generated <u>81%</u> of its electricity from fossil fuels compared to the U.S. average of <u>61%</u>.

Batteries: The <u>10 kilograms of lithium</u> in the average EV can be responsible for approximately <u>a third</u> of the vehicle's cost. The current <u>90,000 tons</u> of global lithium production would need to <u>increase 40-fold</u> to meet expected demand over the next two decades, according to the International Energy Agency. Inevitably, the necessary and rapid ramp-up in mining will bring with it environmental concerns. Opposition from conservation groups, tribal governments, and others has already arisen with respect to lithium projects in <u>Nevada</u> and <u>Quebec</u>.

Bottom Line: Utility-scale electricity generation is still dominated by fossil fuel power, and while renewable energy is rapidly expanding, considerable challenges remain to decarbonize electric generation.

EVs' Impact on U.S. Energy Security

For decades, the U.S. was a net oil importer, but the advent of shale production has made the nation self-sufficient and it is now <u>the world's largest oil producer</u>. As EVs become more prevalent, U.S. transportation energy will face another long-term challenge – finding adequate supplies of lithium.

A Significant Challenge: Current lithium production comes primarily from Chile, Australia, Argentina, and China, the latter of which has a tight grip on the global supply of battery metals, <u>experts note</u>. The U.S. holds <u>only 3.6%</u> of the world's lithium reserves, according to federal estimates.

The only large-scale lithium mining and processing facility currently operating in the U.S. is in Nevada – and it produces just 2% of global supply, according to the <u>U.S. Geological Survey</u>. Two new projects in Nevada – one with the potential to produce quantities equal to a third of current global output – were recently put on hold due to <u>litigation</u> brought by a rancher and environmental groups.

Fortunately, research by BloombergNEF has found that North America – bolstered by the U.S. "Battery Belt," which includes Ohio – is expected to grow its lithium-ion battery manufacturing capacity <u>seven-fold by 2030</u>, with more than two dozen plants by that year. (This figure does not include major announcements since July 1, 2022 – including Honda's forthcoming Ohio battery facility.)

Recycling has also emerged as a potential solution to meet demand. The first U.S. recycling facility for lithium-ion vehicle batteries is located in Ohio's Fairfield County.

Bottom Line: A wholesale shift to EVs cannot occur if legal and regulatory roadblocks continue to hinder or halt expanded mining, refining, and processing of lithium and other necessary metals and minerals. Experts say Congress must act to streamline the federal mine-permitting process to make EV supply chains more secure. Also, innovation breakthroughs will likely be necessary to ensure future production of EV batteries that use fewer critical minerals, including not only lithium but cobalt and nickel, for example.