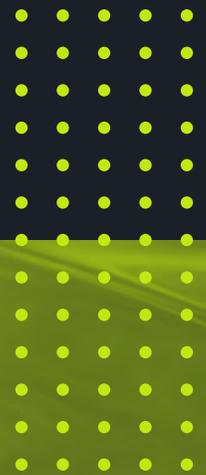


Council on Future Mobility & Electrification

2021 REPORT





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Foreword by the Lt. Governor

Back in 1985, when Robert Zemeckis' Back to the Future first appeared on the big screen, the notion of flying cars and hoverboards seemed impossible. That was a concept that could only be experienced in movies. Now 36 years later, mobility, public transportation, and vehicle electrification have come further than ever imagined, but we are still waiting on a flying Delorean.

When I started serving as the Lieutenant Governor of Michigan back in 2019, I lived in the heart of Detroit and didn't have a car. That might be a first in Michigan politics. I understand firsthand what it means to rely on public transportation. My story is like that of many Michiganders who are dependent on public transport to get to work, buy groceries or attend medical appointments.

Governor Whitmer and I are committed to building a more robust state economy through safer, more equitable, and environmentally conscious transportation for all Michigan residents. Now more than ever, it is critical that Michigan strengthen opportunities for economic growth and job creation while securing our continued leadership in mobility and electrification through forward-thinking policies, innovative partnerships, and smarter infrastructure.

In July of 2021, Governor Whitmer announced the formal launch of the Office of Future Mobility and Electrification. This office is focused on working across state government, academia, and private industry to enhance Michigan's mobility ecosystem, including dynamic mobility and electrification policies and supporting the startup

and scale-up of emerging technologies and businesses.

Governor Whitmer and I want to develop and attract the skills and talent necessary to meet the changing demands of the mobility sector. This is a challenge that Michiganders are ready to meet.

After all, Detroit put the world on wheels. Now it's time for us to be the leader in clean transportation, and we are ready. The Council on Future Mobility and Electrification is another example of how we're fighting to build a stronger, more sustainable future for our kids and for future generations of Michiganders to come.

The following report from the Council on Future Mobility and Electrification will show the progress we have made and what is next. As the future continues to evolve, so will the Whitmer Administration.

**Lt. Governor
Garlin Gilchrist II**



Message from the Chairwoman

Michigan has long been the world leader in the mobility sector, and we are committed to doing whatever it takes to maintain our state's position at the forefront.

The Council on Future Mobility and Electrification (CFME) has developed public policy recommendations that will help maintain Michigan's leadership in advanced mobility and electrification, and I am proud to serve as the Chair of the CFME as it releases its second report.

The public policy recommendations included in this report were designed, debated and chosen because of the significance they will play in ensuring Michigan remains the global epicenter for next generation automated, connected, shared and electric mobility. It is imperative that state policymakers see these recommendations through to implementation.

The report's primary findings stress how Michigan must continue its leadership in automated vehicle policies and smart infrastructure deployment, while also investing in economic and talent development. Similarly, Michigan must also become more EV-friendly and better prepared for the future of electric vehicles.

The CFME's industry experts and public leaders also believe Michigan will take a bold step forward and continue embracing the mobility and electrification sector, if the findings in the report are acted upon.

The publication of this report comes at a time of great advancement in the mobility world. The Biden Administration announced new grants for deploying EV charging stations in April 2021, which was then followed closely by an Executive Order in

July that set a target for all new vehicle sales to be electric by 2030.

This signifies the creation of new jobs and the need for highly-skilled workers. The CFME's February 2020 report noted that the demand for computer-related engineers, for example, will eclipse 45,000 nationally by 2030. Additionally, estimates from the USDOE regarding job creation in the utility sector deploying charging infrastructure will reach 105,000 by 2030.

These are exciting times in both Michigan and the mobility and electrification industry in general, and I am anxious to see what the future holds for our great state.

Edsel Ford, the son of legendary automotive pioneer Henry Ford, once said, "There are no crown princes at Ford." Edsel earned his position and built his own reputation every day by continuously developing the next best vehicle.

We do not take our automotive heritage for granted, and we plan on working hard to keep Michigan at the forefront of innovative mobility.

Susan R. Corbin

Director, Michigan Department of Labor and Economic Opportunity;
Chairwoman, Michigan Council on Future Mobility and Electrification

Executive Summary

The Council on Future Mobility and Electrification (CFME) has previously indicated 2030 as a year of demarcation. Over the next decade vehicle electrification will occur and become the dominant propulsion system on the market, advanced automated vehicle technologies and smarter infrastructure will become a more common part of the mobility experience, and the most valuable part of a new vehicle will change from hardware to software. Likewise, workforce demands will grow and shift, as will other inputs for the manufacturing process, and the need for high-tech talent will exceed what current development pipelines can produce.

Luckily, Michigan currently enjoys the availability of resources necessary to not just plan for these future changes, but to help shape and benefit from them. If the recommendations included in this report are acted on, the industry experts and public leaders who make up the CFME believe Michigan will take a bold step forward and plant our state flag further than any other along the road embracing the mobility and electrification sector. Ignoring these recommendations on the other hand will leave our state far behind our competition and likely unable to catch up given the one-time nature of so many of the resources available to states today.

This report's recommendations center around how Michigan must continue its leadership in automated vehicle policies and smart infrastructure deployment, invest in ourselves and mobility sector economic and talent development, become more EV-friendly and better prepared for electric vehicles, and implement policies that will ensure the future of transportation is safe and enhances mobility solutions for more Michiganders.





This all begins with developing a comprehensive and cohesive state mobility and electrification strategy.

With such a North Star guiding the state's actions we can be assured that not only are state agencies all traveling in the same direction, but that the state and industry are in lockstep. Other proposals included in this report are needed to open up new mobility solutions provided by technological advancements to more Michiganders, like streamlining shared transportation systems and adapting antiquated policies regarding the physical and mental abilities of vehicle operators for the automated vehicle future. The Council also sees a clear need for not just significant but impressive investments in the future of auto related manufacturing, mobility tech startups and associated venture capital, and talent and workforce development. To remain competitive for the automotive industry's future growth opportunities the state must be able to offer more and better site selections, prove it has a plan for building out the capacity of Michigan's talent pipeline, and offer supports to increase the number

and resiliency of startup firms and make them more attractive for private capital investments. Supporting the adoption of electric vehicles and the deployment of EV charging infrastructure is also a must in the Council's view. While more study is required to develop efficient, targeted consumer incentives for the electric vehicles themselves, the merits of incentives for charging infrastructure is well documented, easily replicated, and ready to be implemented with funding. The Council also strongly suggests establishing clear guardrails around the cybersecurity of intelligent transportation systems so as to protect the safety of Michigan residents and visitors. Lastly, if Michigan truly is to be the mobility and electrification leader amongst its peers, the state should act as such in terms of being an advocate on federal policies, beginning with issues related to connected vehicle communications, transportation standards, and mobility incentives.

Introduction

The Michigan Council on Future Mobility and Electrification (CFME) was established by executive order 2020-02, and charged with providing state policymakers on an annual basis with “recommendations regarding changes in state policy to ensure Michigan continues to be the world leader in future mobility and electrification, including autonomous and connected vehicle technology, electric powertrain technology and charging infrastructure, and diverse mobility such as shared and transit.”

The CFME does this with the support of the Michigan Office on Future Mobility and Electrification (OFME), led by Michigan’s Chief Mobility Officer Trevor Pawl, under the direction of the Department of Labor and Economic Opportunity’s Director Susan Corbin.

As explained in the CFME’s last report, the COVID-19 pandemic had delayed the start for development of these initial policy recommendations. This council’s last report was published with a consensus outlook from CFME membership about the value of Michigan’s next generation mobility and electrification assets and identifiable future obstacles to the state’s global leadership in this crucial economic sector. Through the dedication and hard work of CFME members and many of Michigan’s mobility and electrification partners some additional issues were identified, and the policy recommendations included in this report were developed. The goal for these policy recommendations is to build off the strong presence of the advanced mobility and electrification sector already in Michigan, and prepare for the future.

To reiterate from the previous report, the themes for the major hurdles to maintaining global mobility and electrification leadership that the CFME recognizes are on Michigan’s horizon include:

- a need to adapt and persist against ever increasing pressure of global competition for the future of automotive mobility technologies’ research, development, and manufacturing;
- preservation of Michigan’s current lead in terms of future mobility asset concentration and progressive advanced mobility governmental approaches and public policies;
- a need to expand Michigan’s lead in terms of available automobility advanced talent and skilled labor;
- making Michigan’s ecosystem for private sector investments in the mobility and electrification sector more attractive to investors; and
- continuing to ensure and discover new ways that the future of advanced and electrified mobility will help diversify and strengthen Michigan’s economy and grow good-paying jobs.

VOTING

State Entities

Susan Corbin, LEO
 Paul Ajegba, MDOT
 Anita Fox, DIFS
 Col. James Gasper, MSP
 Rachael Eubanks, Treasury
 Liesl Clark, EGLE
 Tremaine Phillips, MPSC

Non-State Entities

Bob Babik, GM
 Emily Frascaroli, Ford
 Steven Bartoli, Stellantis
 Patrick Cadariu, Waymo
 Derek Caveney, Toyota
 Chris Nevers, Rivian
 Cory Connolly, EIBC
 Jeffrey Dokho, UAW
 Dr. Huei Peng, U of M
 Dr. Satish Udpa, MSU

NON-VOTING

Legislators

Sen. Ken Horn, Senate Majority
 Sen. Mallory McMorrow, Senate Minority
 Rep. Jim Lilly, House Majority
 Rep. Ranjeev Puri, House Minority

Senior Advisors

Alisyn Malek, SAFE
 Carla Bailo, CAR
 Reuben Sarkar, ACM
 John Peracchio, CFME Chairman Emeritus

During the CFME's process developing the policy recommendations contained in this report, some additional themes for opportunities were identified and deemed imperative to Michigan's mobility leadership. First, the investments made and proposed by the federal government under the American Rescue Plan, the American Jobs Plan, and other federal legislation are too great to ignore. Michigan must take swift action on the deployment of and planning for these resources so as to not lose our future mobility and electrification leadership, be better positioned to maximize the state's draw down of additional federal resources, and develop leapfrog moments and projects that will catapult the state's mobility industry into an even greater leadership position. Second, is a recognition that the advanced mobility and electrification sector currently enjoys being at the center of gravity of three important elements of policy agendas shared by both the federal and state governments: pandemic economic recovery, combating and adapting to climate change, and infrastructure investments. This is a unique situation that is not likely to exist for long and Michigan would be wise to leverage this opportunity to its fullest extent while possible.

To tackle the daunting task of determining achievable policy recommendations which would further Michigan's mobility and electrification leadership and fit the aforementioned themes, the Council on Future Mobility and Electrification divided into four workgroups: Electrification; Insurance, Regulations, and Public Safety; Economic and Workforce Development; and Automated Vehicle Technologies and Smart Infrastructure. Each workgroup was assigned a neutral, outside Senior Advisor with particular expertise to guide the policy process. The workgroups were made up of Council members, as well as relevant outside stakeholders (see [Appendix 1](#) to learn more about the CFME's workgroup process).

Actions of the Council/ Policy Recommendations

Since the Council on Future Mobility and Electrification issued its last report in February 2021, there has been a monumental change in the importance of electric vehicles and charging infrastructure.



The federal government is assessing and addressing gaps in auto manufacturing supply chains; investing in a national EV charging network; and has set a national goal for EV adoption. In July 2021, President Biden signed an Executive Order setting a target that half of all new vehicle sales will be electric by 2030. These changes not only highlight the importance of work being done by CFME and OFME, but create new opportunities for Michigan to leverage the strength of its automobility sector to further the state's leadership and secure jobs for the next generation of electric vehicle and charging infrastructure manufacturing, strengthen our state economy through diversification into more high-tech industries that are the emerging profit pools in automotive products, provide attractive employment opportunities for a highly talented workforce, and achieve climate goals

while enhancing grid resiliency and supporting job growth in the energy sector.

Because advanced mobility and electrification issues sit at the intersection of the significant federal and state policy initiatives of economic growth and job creation, infrastructure rebuilding and upgrading, and addressing climate change, there is an opportunity at hand to further Michigan's mobility leadership in these spaces with more resources available than ever before. The CFME firmly views this opportunity as one that the state of Michigan cannot pass up if global mobility and electrification leadership is to be maintained. With these opportunities in mind, the product of the CFME's policy development process and resulting recommendations are broken down by workgroup topics as follows.

AUTOMATED VEHICLE TECHNOLOGIES AND SMART INFRASTRUCTURE

In its early meetings the CFME workgroup covering automated vehicle technologies and smart infrastructure surveyed and researched other sets of public policies and determined that Michigan's automated vehicle (AV) and smart infrastructure laws from 2016 are still among the most cutting edge in the world and still strongly support development of the advanced mobility sector. However, other states have begun to adopt Michigan's original policies and the Great Lakes state no longer enjoys a convincing lead in this area. Furthermore, other states' laws benefited from both being developed after industry had settled on some common terminology and definitional meanings and being able to incorporate modern advancements in AV technologies.

The workgroup determined that to remain the premier state for researching, developing, testing, commercializing, and deploying AV tech and smart infrastructure, Michigan must keep its AV statutes up to date, develop a state strategy to plot a course for the future, and invest ample resources in the state agencies focused on advanced mobility and developing that strategy. To remain a global future mobility leader, Michigan must also build off its strength of forward-looking public policies by implementing new policies to facilitate the next generation of smart infrastructure and AV technologies being developed in the state. Additionally, it was noted that many AV and smart infrastructure policies are shifting focus from the states to the federal government, and Michigan should embrace federal policymakers' interest and be the leader of state perspectives on these issues.

Resource a cohesive Michigan Mobility Strategy

There is a need for Michigan's Office of Future Mobility and Electrification to develop a cohesive

mobility strategy and vision plan. Such a strategy would provide state agencies better direction for their mobility and electrification efforts and establish goals and metrics required to keep the state on track. The \$1.5 million proposed in Governor Whitmer's FY'22 budget recommendation would support this work product, ensure it is coordinated with other state agencies' strategic plans, and utilized to keep all of state government on track and sharing in the mission of continuing Michigan's mobility and electrification leadership.

Adopt the leading and most common AV standards and continue to survey and evaluate other states' and trade associations' model AV laws

The CFME recommends that the legislature update the taxonomy of the Michigan Vehicle Code (Public Act 332 of 2016) to adopt terms which have become commonly accepted or industry standards since the Michigan laws on AVs were enacted in 2016. Certain terms, such as "personal delivery device" have become widely used elsewhere. Other terms, like "automated mode" have been replaced by different terminology. The Michigan Vehicle Code should be amended accordingly to provide consistency with other states and federal authorities and ease discussions with industry and research partners.

The Automated Vehicle Technologies and Smart Infrastructure work group discussed 14 specific recommendations of the AV Roadmap proposed by the Alliance for Automotive Innovation. Michigan already complies with 11 recommendations for leading states. One of the remaining recommendations is to refrain from adding equipment standards at the state level, but

to reserve those for federal attention. The Alliance cited a provision for data recording which applies only to SAVE project vehicles, as described in MCL 257.665b, providing on-demand automated fleet transportation.

Two specific examples were raised. First, the 2016 legislation prohibited local ordinances on most aspects of on-demand automated vehicle fleets to allow the concept to take form and work through demonstrations. The predictions for broad commercialization of such fleets has still not been realized, and the CFME recommends either eliminating the current sunset date of December 31, 2022 or extending it to December 31, 2025. The CFME also recommends that policymakers remove the current limitation for on-demand automated vehicle fleets that excludes commercial vehicles. Revising this provision would allow commercial motor vehicles to be included in demonstrations and deployments showing new efficiencies in freight movement.

Improve the internal capacity of state government by increasing funding for state departments' mobility efforts

The CFME recommends increasing the budget and staff for state agencies and offices working on the future of mobility, electrification, and smart infrastructure. This will facilitate more rapid decision making, innovative thinking and processes, as well as enhance current mobility ecosystem development programs

While discussing new technologies, state regulations and state government interactions with developers and industry, workgroup members noted the state and its private mobility partners would be aided by additional funding for state agencies working to codevelop the sector. In some cases, such as intelligent transportation

system installations, it will mean direct funding of infrastructure. Other funding could bring more state engineers and planners to help more developers and testers. The CFME is not able to recommend a specific value for funding, but desired policymakers to consider the role of funding in reaching policy and economic growth goals. Just as the missions of the CFME and the OFME includes ideas and efforts from different state agencies, funding for mobility and electrification will include programs crossing traditional lines. Funding and personnel positions for the OFME should be included as well as programs within EGLE focused on electrification, offices at MDOT focused on ITS and multi-modal transportation, especially those dealing with public transit, and business development and community revitalization efforts at the MEDC.

Michigan should permit operations of personal delivery devices (or automated delivery devices), and extend the permissible vehicle type for on-demand automated vehicle fleets to include commercial vehicles

Balancing delivery desires, consumer preferences, and innovations changing the future of the logistics industry with the impact on jobs and economic disruption, especially emerging from the current pandemic, requires a steady commitment and a strategic plan for transition based on real data. The growth of last mile or home delivery of goods is easily observed and well-known. Even accounting for the special circumstances of the COVID-19 period, the phenomenon seems here to stay. Consumers have become more accustomed to swifter and more convenient delivery of goods. Last-mile delivery innovations imply efficiency and minimized traffic impacts by replacing large delivery vehicles with automated ground devices and unmanned aerial systems. Michigan lawmakers have considered legislation to allow automated or personal delivery devices to transport goods



over short distances on sidewalks and streets to homes and businesses. In the current 2021-22 legislative session, Senate Bill 538 and Senate Bill 560 have each been introduced to allow such devices and provide guidelines for their use. Over a dozen other states have enacted such measures. While new jobs in packaging and delivery seem likely to be created, special consideration is needed for workers who presently provide these services and who may be displaced. Part of the challenge is to understand what new job opportunities may be created. Attention is also needed to retrain current workers to obviate technology advancement at their expense. The CFME recommends passage of legislation that permits the thoughtful and safe, and scalable use of automated ground delivery devices with an associated jobs impact study so that the state can better prepare for the future of the logistics industry.

The state should revise its driver licensure laws to facilitate greater mobility for persons with disabilities or other personal mobility barriers

The CFME recommends amending Michigan's driver licensure laws in advance of the higher levels of automation to firmly establish the independent mobility solutions for those currently challenged or legally barred. Michiganders with disabilities are among the most hopeful advocates for automated technology. Current driver licensure laws, enacted decades before the new technology, legally block them from independent mobility based on an ability to safely operate a motor vehicle that, over time, has developed the ability to operate itself. While commercial use of vehicles with automation levels four and five is still in the future, it is not too soon to plan for it (the scale or levels of automation were established in SAE International J3016 "Taxonomy and definitions for Terms Related to On-road Motor Vehicle Automated Driving Systems"). More importantly, it is not too soon to reassure in state law that persons with disabilities will enjoy the freedom-giving technology when it becomes available instead of waiting for future revisions or "special add-ons" to the law. Driver licensure is a traditional regulatory role for states, and Michigan can set a clear signal and standard now that will benefit the state's global mobility leadership status.

Michigan should develop and implement policies supporting the world's first deployment of a connected and autonomous vehicle (CAV) corridor

The CFME recommends establishing policies and enacting laws to aid in the successful development and deployment of the world's first connected and automated vehicle (CAV) laneway. While the 40-mile Detroit to Ann Arbor CAV corridor is the first of its kind, it will not be the last and Michigan has the opportunity to lead in developing state policies that will facilitate these smart infrastructure deployments. While a myriad of policy considerations may arise over the lifespan of developing, building, and operating CAV smart infrastructure, the public policy considerations known to be useful today include creating CAV lane designation and dynamic road use charging authorization, permitting the use of CAV innovations in infrastructure design, and, most importantly, ensuring that CAV lanes are a safe and effective service to the public and our economy. To the extent that CAV lanes will present the opportunity to both disrupt and create new jobs, a jobs impact study should also be included as part of these statutory changes.

State agencies should work with the mobility industry to develop systems for sharing of real-time construction zone data for dynamically updating maps and artificial intelligence (AI) and addressing worker safety

Michigan must lead the way in providing dynamic information on fast-changing situations like construction zones. Road agencies struggle to keep the data for mobility technologies up to the precise and timely standards needed. MDOT and other Michigan road agencies acknowledge the need and the challenges in doing so. Leadership in this area can lead to a huge breakthrough in technology

development and tangible benefits for the motoring public, the first responder community and road construction workers. CFME recommends MDOT and OFME work with the mobility industry to develop systems for sharing construction zone data in real-time to enable the dynamic updating of maps and using AI to keep construction workers and motorists safe. The CFME recognizes this may require additional back office support staff to operate ITS, which is accounted for in a previous recommendation to increase funding for state mobility offices and agencies.

Michigan should advocate to federal policymakers about C-V2X and the need for resources to states to upgrade and accelerate deployment of connected infrastructure systems, as well as the need for additional spectrum beyond the limited 30 MHz spectrum that has been allocated for transportation safety

Since late 2019, the Federal Communication Commission (FCC) has undertaken a regulatory process to revise the allocation of the 5.9GHz portion of the wireless spectrum. That portion of the spectrum had previously been dedicated to traffic safety applications. However, in FCC Docket No. 19-138, the FCC chose to reallocate the spectrum to reduce the portion for traffic safety and allow it to be used by other interests. The implications for traffic safety are to lose a significant portion of that available spectrum, to raise the possibility of signal interference from nearby users, and to saddle road agencies with costs of converting to new, compatible equipment. This is an especially important issue for Michigan and local road agencies who have recognized the value of ITS and connected vehicle technology and were early adopters. While the regulatory process has reached its conclusion, hope remains that other portions of the spectrum might be identified for traffic safety, and that road agencies

can be reimbursed for conversion costs to other forms of connected infrastructure communication devices (e.g. CV2X or cellular-vehicle-to-everything technologies).

The CFME recommends the state, through legislative resolution and agency and political advocacy, educate federal policymakers about the need to provide the states reimbursement for the costs associated with conversion of road-side units (RSU) to the newly endorsed technology (C-V2X) and continue to encourage deployment of this technology through federal grants. Without such reimbursement, road agencies will essentially pay twice for the same safety benefit, effectively decelerating or even terminating deployments. Policy makers at the federal level should recognize the importance of the situation and provide reimbursement based on the cost of upgrading states' connected systems as they existed when the spectrum reallocation occurred. There will also soon be a need for additional spectrum beyond the 30MHz that have been allocated as these technologies transition both to 5G and then also get utilized for advanced use cases like AV's. Various studies have suggested that an additional 40MHz of spectrum will ultimately be needed. The FCC should ensure that this additional spectrum need

is met to ensure the safety and traffic efficiency benefits are realized both now and in the future.

Michigan should also advocate federal policymakers about the need for a uniform, national automated vehicle (AV) policy and about revisions to the Manual on Uniform Traffic Control Devices (MUTCD) to include items that facilitate AV deployment

Michigan must lead among the states in advocacy to the federal government on the future of mobility and electrification. The CFME recommends Michigan officials advocate and attempt to influence content and decisions on federal AV policy and guiding documents. While states have a vital policy role in automated vehicles, there is a pressing need for a federal policy including legislation. Important topics of traditional federal regulation in design, construction and performance of vehicles need policy direction and to start rule making for important regulations at that level. Outside of legislation, Michigan should actively contribute to discussions on revisions to the Manual on Uniform Traffic Control Devices (MUTCD) to ensure the promise of technology is properly reflected.



This report builds on the momentum Governor Whitmer started in creating the new Office of Future Mobility and Electrification and the Council on Future Mobility and Electrification. The pace and excitement of announcements in these fields in Michigan is building. This report and the work of the council will be key in bringing focus and energy to state efforts going forward.

TREVOR PAWL | Chief Mobility Officer

ECONOMIC DEVELOPMENT

The CFME workgroup covering economic development issues was quick to identify that many of Michigan's longstanding shortcomings in its economic development toolbox are the result of insufficient funding and budget prioritization. These shortcomings were then exacerbated by the COVID-19 pandemic. With the passage of the American Rescue Plan, the anticipated resources to be deployed by a federal infrastructure package and the American Jobs Plan, as well as the state's own one-time budget surpluses due to increased consumer spending during the pandemic, Michigan has a generational budget opportunity to fund many of the mobility and electrification sector economic development tools that have needed attention for years. The recommendations are designed to be transformational one-time investments that will translate into sustainable, long-term growth and monumental leapfrog opportunities that will keep Michigan in a global mobility and electrification sector leadership position.

Develop a better inventory of large sites

Site selection is the beginning of all project lifecycles and is the most important factor of siting a project in Michigan. The state's current inventory of "project ready" sites is insufficient. Michigan needs such locations to continue to compete effectively for attraction projects. Michigan has lost many opportunities since 2008 because Michigan's sites were not "project ready." Many of Michigan's industrial properties are in underserved populations or townships. Communities need financial and technical assistance to improve the industrial properties in their region. We are years behind the site preparedness strategies employed by Southern states, and an industrial sites program

will assist in closing this gap and mitigate risks. To increase Michigan's inventory of industrial sites and enhance those sites for business attraction and growth opportunities, the state should capitalize a large site development fund to acquire and create "ready" site properties for mobility business development and attraction.

Business development projects requiring substantial infrastructure modifications including water, sewer, wastewater treatment, electric power, natural gas, telecom, rail and/or road improvements present particularly strong challenges, especially when working to address large enough parcels to meet business needs. Michigan has a limited number of existing sites and facilities available to support its expanding businesses and a limited number of sites 300 acres or larger, with full infrastructure in place. For projects requiring 1,000 acres or more (megasites) Michigan can currently only offer two sites, neither of which are served with municipal water and sewer and both require substantial upgrades to other public and private infrastructure. By comparison, North Carolina currently has 10 megasites, including at least six known to have full infrastructure. The cost to provide public infrastructure to sites can range from \$2 million to \$100 million or more for very large projects and utility users. It is critical that the state be able to offset these infrastructure connection costs and develop new sites to expand its inventory of build-ready sites, with a particular emphasis on large sites that can support business development projects that can have a transformative impact on regions and workers substantially impacted by the COVID-19 pandemic and populations living below ALICE thresholds.

The CFME recommends the state capitalize a

strategic site development fund with \$100 to \$250 million as a way of scaling or supplementing the MEDC's Build Ready Site Program. Based on MEDC estimates this level of funding could develop six large sites (300 acres or larger) and an additional 30 smaller sites in less-populated areas of the state. This funding will allow smaller to medium sized businesses expand their companies as they position their operations to recover from impacts of the pandemic, and prepare for new Industry 4.0 and other technology demands. Projected outcomes are 8,529 in acreage development, \$11.4 billion in private investment, 19,600 in new jobs created, and \$10.1 million in public/private match funds.

Grants from the fund should be awarded to applications that: prioritize impact to geographically disadvantaged areas and distressed communities; demonstrate that site development will lead to a substantial number of pathway job opportunities and equitable, high wage growth opportunities for individuals; benefit target industry sectors (evaluated based on potential economic impact to the local community, region and the state, including but not limited to MEDC strategic sectors); result in green infrastructure and site design and positively address environmental justice communities; emphasize COVID-19 impact mitigation such as site development for specific end-users that have been impacted by the pandemic.

Michigan has lost several projects to Alabama and Mississippi. Alabama began the site program in 2008 and currently has 60 certified sites identified across the state. Mississippi's site program has a matching grant of up to \$50,000 for Ready Site or \$250,000 for Premier Site and MDA funds site applications. Tennessee has the nation's top site program and Georgia's is ranked second. Both programs have searchable real estate databases and provide funding to communities with industrial property. The differences from Michigan's program

are: year-round programs with consistent funding and site awards are made year-round, a dedicated funding source, a dedicated third party certification (engineering firm or site consultant firm), buy-in from the local communities, and continuous marketing.

Redesign economic-talent development tools to be smarter, more coordinated with talent development goals

Tax incentives, P3 style investments, land options, and other forms of monetary, traditional economic development tools are not alone going to help Michigan keep pace with business development opportunities in the future of the automotive sector. We have already started to see an evolution in the Requests for Information (RFI) to which the state is being asked to respond and in the types of questions and the strategic focus of the issuing companies. Relationships are important, and perhaps even more than financial incentives, companies want to know that the states they're investing in are planning for their mutual, long-term success. Talent remains a significant interest, but companies want to know how states plan to supply talent directly to their industry. Michigan needs to solve for these factors to remain competitive in the automobility economic development space.

The CFME recommends that the state refocus its economic development tools to be more comprehensive. Through a more comprehensive set of economic development tools the state can make its economic development investments go further while still attracting more future mobility companies, help solve for these same companies' long term talent needs, establish more stickiness for those companies to remain in Michigan and continue to make more investments.

The state should review its current toolbox of economic development incentives and, where

and when it is strategically advantageous, aligns with both a target company's vision and the local educational institution's goals, the state should tie its incentives to requirements that the receiving company play a role in the local education, workforce and talent development institutions.

The companies awarded enhanced talent economic development incentives should be incented to engage in the local PK-12 system, community college, or university. Options could include:

- sponsoring a FIRST Robotics team;
- sponsoring a coding competition team or class;
- supporting a STEAM program with equipment, teacher externships, guest lecturing/teaching, projects and curriculum designs, or by offering real-world educational opportunities;
- offering company space as an age-appropriate field trip site;
- creating a high school internship or mentorship program;
- creating a scholarship fund for the local community;
- creating a postsecondary internship or mentorship program; and
- having senior engineers as adjunct teachers at the local postsecondary institution.

The MEDC, the target company, and the local educational institution would need to develop the location-specific plan that works for all involved, with the primary focus being on the experience and learning opportunities for students.

The proposal is not to simply spend more dollars on economic development, but to make the current economic development tools more robust, and perhaps adjust the state's ROI formula to be more

focused on holistic economic impact while still being primarily a jobs-driven activity.

The goal is to achieve an increase in Michigan's stickiness for the automotive sector through an enhanced capacity of the sector's talent pipeline. Generally, a ROI is anticipated, but without the data that would come as a result of attempting this sharpening of our economic development tools it is tough to estimate what the percentage increase on today's economic development activity would be.

An ancillary benefit of a change like this is the potential for the state's economic development work to help provide a more attractive set of engineering, science, mathematics, art, and technology educational offerings at local educational institutions.



This would make the entire community more attractive to future residents and positively impacting overall economic health of the area.

While some states, like Illinois, have established partnerships between the state, an automobility company, and a community college to create a direct-to-company talent pipeline, the CFME is not aware of any state that ties economic development incentives in the way being proposed here. This initiative would help make Michigan stand out from other states as a place that is willing to implement unique business attraction efforts, and indicates the state government intends to have long-lasting, symbiotic relationships with the sector.



The comprehensive economic-talent development tools could be developed and tested at a pilot level with a predetermined education institution that desires this sort of relationship.

Create a “mobility wallet”

The CFME recommends the state spend \$2 million to create a centralized platform to systematically launch and scale mobility solutions statewide. This platform would work to remove transit barriers and provide critical, post-pandemic solutions like contactless fares, common transit fares and parking payment processing across the state, reward programs, dynamic pricing and routing and goods delivery. Transit and shared, multi-modal mobility are essential to moving large numbers of workers, commuters and the general public. Increasingly, new modes of micromobility such as electric scooters and e-bicycles can also play a role. However, riders are challenged in moving from one provider or mode to another. While bus service may be available to someone lacking a personal

vehicle, a daily commute may involve different bus systems, different fares and different acceptance of payments. Commuters and employers alike are frustrated at the lack of seamless connections and the likelihood of gaps and delays in timely travel. Additionally, a tool developed with a specific consideration for those without access to traditional financial services (unbanked Michiganders) will help drive greater equity in our transportation system. MDOT is beginning important groundwork in creating harmonized payments and transactional management to speed and smooth the movement from one provider to another. Residents and workers should be able to use the current services and others such as transportation network companies so that new innovations can serve them without the stumbling block of uncoordinated payment.

Establish and capitalize a startup resiliency fund

Michigan is innovative, but could commercialize more of the innovations developed here. In the

United States, Michigan is 7th in academic R&D and 5th in business R&D (% of GDP nationally) and generates the 12th most patents per capita. Young companies drive job creation in the US, but Michigan has a lower share of them in our economy. These dollars are lifelines to young companies that drive job creation. Michigan is the second highest receiver of automotive venture capital (VC) funds, but is still just 1/10th the scale of California. Unlike other regions, the majority of automotive VC funding in Michigan is focused on hardware, with just 6% of investment in software. Even in hardware technologies, VC funding in California surpasses Michigan

By being more competitive and having a better ecosystem for VC and private equity funding Michigan will be able to help identify and develop more mobility startups and associated jobs from the creation of intellectual property (IP).

The CFME recommends that in order to attract more venture capital investments to Michigan's mobility ecosystem, the state should establish a \$200 million startup resiliency fund. The fund would seek to fill a gap by targeting underserved and underrepresented entrepreneurs.

This fund would be a budget investment with administrative operations. The fund would contain three main parts: as a targeted form of small business support, the state would provide equity investments (\$140 million), grants (\$5 million), in-kind services, and technical assistance to start-ups (\$10 million).

Start-ups are worthy of a dedicated program: According to Michigan Venture Capital Association, "Capital available for new investments in 2020 was \$503 million, a decrease of 44% over the last five years." Venture capital activity in Michigan dropped

from \$514 million in 2019 to \$25 million in 2020. "MVCA survey respondents estimate that \$1.2 billion of additional venture capital will be required to adequately fund the growth of Michigan's 165 startup companies in the next two years."

The initiative will be targeted exclusively towards Michigan start-ups that faced documented COVID-19 impacts, and will specifically target support for entrepreneurs of color, women owned businesses, and businesses located in geographies whose economies were disproportionately impacted by COVID.

The Initiative's three lever approach is designed to diversify risk and drive returns across three core objectives:

- 1 gain broad exposure to growth and value creation in Michigan-based businesses in sectors that have been harmed by COVID;
- 2 increase investment capital in Michigan, particularly in communities that have been most harmed by COVID or that have lacked traditional access to investment opportunities;
- 3 produce financial returns that can be reinvested into hard-hit communities.

The immediate action for setting up the fund would involve:

- establishing a State Benchmarking Exercise and Advisory Committee;
- setting up and engaging In-State, Global Advisory Committees; and
- implement fund structure.

Benchmarking Exercise: LEO, Treasury and MEDC and a core group of in-state local partners would conduct a series of interviews with state officials that have launched, or are launching, similar fund constructs. Ohio and New York have operated successful funds of more than \$100M for years to grow jobs in key industries. Ohio's \$150M fund has invested in firms that have employed ~3,000 people. Firms that received funds from the state of Ohio employed staff with 50% higher wages than average in-state employees. And Wisconsin has \$100M allocated for a new fund this budget cycle.

Advisory Committee: A group of advisors will need to be assembled to help guide the fund creation process. This includes defining fund structure and strategy, identifying potential fund managers, and aligning potential co-investors. These advisors will be a mix of local players and Michigan expats with deep experience and expertise in investment strategy and fund management.

Fund Structure, Governance, Management and Operations: A halo oversight structure will govern all three levers. Each lever will have a dedicated Fund Manager (individual or third-party firm). Fund Managers to be appointed by LEO, Treasury and MEDC with counsel from the Advisory Committee. The Fund Managers would have discretionary mandates over their respective capital allocations. But they would work closely together to ensure a cohesive strategy and report to an oversight board appointed by LEO, Treasury, and MEDC. LEO and MEDC will work with fund managers to provide business development support to maximize the Fund's ROI.

Fund Structure Implementation and Investment Lever: Below are program design assumptions based on a \$140M allocation for Fund of Funds investments. With guidance from the Advisory Committee a final recipient fund criteria, portfolio guidelines and selection process will all be determined.

Selection	Competitive process to identify recipient funds; recipient funds could include net new funds or special purpose vehicles
Scope	Minimum of 5 recipient funds. A diversified investment strategy and structural flexibility will be important to balance risk and optimize return profile. Other states with funds follow a similar model. Adjusted returns from recipient funds will be reinvested in perpetuity.
Allocations	1:1 private/state match; allocations not to exceed \$28M in a single fund.
Criteria and portfolio guidelines	<p>New funds or emerging managers seeking our fund's investment must secure commitment from one institutional or strategic LP in an amount equal to or greater than the target investment from our fund. Recipient funds may invest across seed - Series C stages. Our fund manager would pursue a diversified strategy to diversify risk and align with critical funding gaps identified in the state. Funds must invest the amount of state funds into firms based in Michigan (location of headquarters and have a majority of employees in Michigan). The Initiative would target support towards entrepreneurs of color and women-owned businesses.</p> <p>Our fund can lean on other state fund precedents. The proposed Wisconsin Fund has 20% of funds under management that must be invested in minority-owned companies, women-owned companies, or companies located in underserved areas. And the New Jersey Innovation Evergreen Fund has 25% of fund proceeds invested in qualified venture firms that will invest in companies located in Opportunity Zone census tracts in New Jersey.</p>
Structural performance incentives	10-year restricted Limited Partnership agreement to encourage a cycle of dynamic fund investment. Implement call options - i.e. a call option on our fund's shares at cost (plus interest) for a period of five years.

Programmatic Grant Lever: Below are program design assumptions based on a \$50 million allocation for non-equity grant-based investments or co-investments. With guidance from the Advisory Committee, we will determine final criteria for companies or co-investors applying for grants.

<p>Co-investor criteria</p>	<p>Individual/angel investors, syndicate funds or venture capital firms may be eligible to apply to become accredited co-investment partners. Potential co-investors would apply for accreditation and be evaluated on several criteria including assets under management, geographic location and track record of investments into early stage, high-growth companies aligned with our fund’s focus areas. Investors will be returns-focused but will also share in our mission to enhance the state’s innovation ecosystem and spur economic development.</p> <p>Co-investors can apply for co-investment in startup companies located in the State of Michigan. LEO and MEDC will leverage the Michigan Next platform to align high-profile co-investors to commit to making one angel investment per year into a Michigan-based company in our fund’s focus areas. Companies may apply directly for grants to offset costs related to expansion to or testing/deployment in Michigan</p>
<p>Co-investor deal criteria</p>	<p>Accredited co-investment partners would be responsible for sourcing, performing due diligence and negotiating deal terms before approaching our fund. Deals must have 2:1 match from private sources at the time of investment.</p>

Technical Services Lever: With guidance from the Advisory Committee, LEO, MEDC, and Treasury will determine complementary technical services to help portfolio companies succeed.

This fund would be revenue negative at first, but the initiative is a one-time investment and would recycle capital from returns. There would be an estimated return on investment, though there are too many variables to accurately estimate values. This fund is intended to operate with a required 1:1 private match.

This initiative will catalyze economic diversification, making our state more resilient and less susceptible to future economic downturns. It will support more small business startups, and both grow demand for, and offer career options to a more high-skilled workforce.

The initiative will be targeted exclusively towards Michigan start-ups that faced documented COVID-19 impacts, and will specifically target support for entrepreneurs of color, women owned businesses, and businesses located in geographies disproportionately economically impacted by COVID.

Michigan is absolutely behind other states with regards to policies and investments to develop a robust venture capital market. Techniques used have experienced success in other states and countries around the world. Success would be helping unlock private investment into Michigan’s entrepreneurship ecosystem, while creating the environment for the long-term creation of good jobs.

Create a Global Center of Excellence for both Battery Innovation and Responsible Artificial Intelligence

Universities are critical to building tech ecosystems. In Silicon Valley, Stanford University played an instrumental role in establishing the region as the global epicenter of technology innovation, in large part due to its robust R&D pipeline. Stanford's role in catalyzing the Silicon Valley ecosystem can be traced to the creation of Stanford Industrial Park in the 1950s. By establishing a physical center for collaboration, Stanford sent a signal to the private sector that it was a committed partner in shaping the future of technology. From 1970 to 2010, Stanford's Office of Technology Licensing disclosed 8,300 cumulative inventions and executed over 3,500 licenses for companies, including Google. The strength of Stanford's research programs also created stickiness in the ecosystem, as spin-out companies were incentivized to remain in Silicon Valley for evergreen access to skilled talent. At Mountain View-based Google, for instance, 1 in 20 employees graduated from Stanford. More recently, the University of Texas at Austin has driven economic development through programs like the Austin Technology Incubator, which resulted in the formation of 300 companies and generated a \$3 billion economic impact in Texas. Tech ecosystem growth in both Silicon Valley and Austin has been intrinsically tied to – if not directly catalyzed by – universities committed to cutting-edge, collaborative innovation.

The CFME recognizes there is a compelling opportunity to leverage Michigan's network of research universities to advance the State's mobility leadership goals and build a vibrant ecosystem around two emerging areas: Artificial intelligence (AI) and sustainable batteries. The CFME strongly recommends the state establish these two Global Centers of Excellence with a \$50 million investment.

Venture capital funding for AI companies totaled \$61 billion from 2010 to 2020, while funding for battery storage, smart grid, and efficiency companies increased by 12% from 2019 to 2020, rising to \$2.6 billion. The volume and pace of venture activity indicate that these areas are poised to shape the world for decades to come, positioning Michigan as the leading tech ecosystem for urban infrastructure, equitable mobility, and sustainable transportation. This proposal recommends two global centers of excellence for created to focus on responsible AI and emerging battery innovation.

Global Center of Excellence for Responsible Artificial Intelligence: The establishment of a multi-university partnership to research and apply responsible artificial intelligence (AI) to identify, analyze, and improve local transportation, cybersecurity, and logistics networks. This would be in a way that propels cities and rural areas into an equitable and sustainable future. Selected universities would work together to develop artificial intelligence algorithms meant to improve global infrastructure and transportation networks, starting in Michigan. The focus will be on addressing the question of how AI can best be used to enable and accelerate equitable mobility.

Global Center of Excellence for Battery Innovation: In parallel, a global center of excellence for emerging battery technologies would be launched, also as a multi-university partnership, to reinforce Michigan's leadership position in vehicle electrification and transition Michigan's workforce to lead an electrified future across all modes of transportation. Batteries hold the key to transitioning away from fossil fuel dependence. Cutting edge research and Innovation will be a cornerstone for building a globally competitive battery industry in Michigan and positioning the state to capture the massive economic opportunity underlying the shift to battery-based mobility and energy systems. The growth in EV sales, in large

part, is linked to reductions in cost, improved performance of lithium-ion batteries, and a commitment to the environment. The creation of research programs that:

- enable EV batteries that charge in less than 10 minutes while maintaining at a ~300 mile range (lasting for the life of a vehicle),
- develop batteries that achieve EV range and charge rate parity while halving the size of the battery cell,
- lead the development and application of new manufacturing processes and more affordable materials,
- leading the development of new battery recycling technologies,
- dramatically improving safety (non-flammable), and
- halve battery pack costs.

Both Centers of Excellence can incorporate private, federal, and local match requirements. These new in-state assets will position Michigan and multiple universities and partners to better compete for federal funds and private capital.

These two Global Center for Excellence could be implemented like other examples of the state partnering with universities on joint operations or projects through Memorandums of Understanding (MOU). Selected universities for the responsible AI excellence center must have experience in artificial intelligence, next generation infrastructure and transportation systems, and quantifying the impact of technology in diverse communities. Likewise, the university partners selected for the battery innovation excellence center must have experience in battery materials, manufacturing, design research, and a strong history of collaborating with industry partners.

Once the official partnerships are in place, technical implementation for the Global Center of Excellence for Responsible Artificial Intelligence should focus on developing transparent AI models for mobile users. Due to the rapid adoption of digital technologies, many applications that once treated users as passive entities must now consider them as active participants. This is particularly the case for companies or utilities in the mobility or infrastructure space that are tasked with optimizing the performance of a system that people are actively interacting with in real-time. To address these challenges, the center will focus on the development of 'glass box' models that increase transparency, accountability, and trustworthiness without sacrificing learning performance. Cybersecurity would also be a focus.

The state-academic partnership should also focus on AI systems that balance efficiency and fairness. As companies or utilities leverage these learned models, they typically focus exclusively on improving system efficiency. However, this singular focus creates large discrepancies between individual user experiences. Unfortunately, this type of approach can lead to large discrepancies in travel times that unfairly burden the poorest in our communities. To address this challenge, the center will focus on technologies that help companies or utilities account for users' economic hardship.

The state-academic partnership should also conduct user-inspired research to better understand what drives innovation while enhancing safety. Each of these major research efforts will build upon prior efforts around fare optimization, data driven decision-making that fits into the larger context of transportation applications. The properties of any developed AI algorithm will be directly motivated by user-inspired research. Any developed algorithms will need to be robust and verified to operate correctly since the safety risk

associated with failure is high. The development of such algorithms should make cities' accessibility more equitable.

Likewise, once the partnership is solidified, the Global Center of Excellence for Battery Innovation should focus on developing:

- sustainable materials design,
- integrated Computational Materials Engineering,
- materials synthesis (anodes; cathodes; coatings),
- electrolytes (solid and liquid),
- characterization and analysis,
- integration and production at cell, module, and pack levels,
- end-of-life management, and
- fully integrated cradle-to-grave lifecycle and techno-economic assessments.

While the range of EVs now rivals that of gasoline vehicles (>300 mi), the recharging times (>30 min.) lag significantly behind refueling times (3-4 min.). This is generally viewed as a major barrier to widespread consumer acceptance of EVs, which is partially fueled by range anxiety. The center would accelerate these technological advances towards commercialization and spark new academic-industry partnerships in critical areas of manufacturing, including reducing cost, increasing throughput, and improving environmental sustainability. The center will focus on deep collaborations with automotive OEM partners in Michigan, including Ford, GM, Toyota, and Nissan Technical Center North America.



TALENT AND WORKFORCE

The CFME's February 2020 report noted that by 2030 "the mobility industry demand for computer-related engineers will eclipse 45,000 nationally," of which Michigan's strategic target for remaining a global mobility and electrification leader is to attract, develop, and retain one-third of these software and advanced mobility engineers. In that same report the CFME also cited USDOE estimates regarding job creation in the utility sector related to mobility and electrification infrastructure will reach 105,000, also by 2030. Without a greater emphasis on reskilling and upskilling the state will lack the most critical and beneficial part of our mobility and electrification future: quality jobs and hardworking people. The CFME is recommending these three initial policies in order to help Michigan reach its goal of being a worldwide leader in the mobility and electrification sector today, tomorrow, and for the next decade.

The state should enhance R&D tax credits by expanding qualifying items, including specific targets for talent and electrification

The rapid technological changes occurring in the mobility sector represent an opportunity and a threat for Michigan. To maintain the state's industry dominance, it is paramount that cutting edge research occurs in Michigan. Providing incentives for firms to conduct this research and to build the talent needed to be a world leader will help ensure that Michigan maintains its dominant position. Michigan is the epicenter of the U.S. automotive industry leading the nation in both auto production and R&D. New technologies such as electrification and the development of connected and automated vehicles are transforming the industry. These technologies are being developed in Michigan but are also being developed in technology

centers across the country including Silicon Valley, Pittsburgh, Austin, etc. Supporting research and talent development in Michigan is essential to ensuring that Michigan maintains its leadership role.

By providing an R&D tax credit, Michigan can increase the return on investment that firms realize from these activities. This provides an incentive for new firms to locate here and for existing firms to expand these R&D efforts. The state should enhance R&D tax credits by expanding qualifying items, including specific targets for talent acquisition and retention and electrification.

This policy would require a statutory change that would create a state R&D tax credit that is tightly focused on talent development and electrification to provide an incentive for firms to increase strategic investments in these areas and to help nurture a culture of innovation in Michigan. To help ensure the credit is focused on new investment, it could be limited to R&D spending above a base year, analogous to how the federal credit works. In addition, the credit could be limited to the types of R&D activities identified as being most in need of subsidy. To keep the tax expenditure costs to the state at a minimum and the value of the credit high to targeted outcomes, there are a variety of credit design options that should be considered. One option is to include such a credit within qualified investments in qualified businesses. The current qualified investments credit is found in Section 206.278 of the Michigan Compiled Laws.

- The credit could also be limited to just the compensation paid to individuals conducting R&D to keep it talent focused.
- If there were an interest in focusing the effort on

incenting R&D at startup firms or second stage businesses, limitations could be put in place on the size of the businesses that qualify. A focus on new and emerging businesses could make the credit a tool for building an innovation culture in the state.

- A decision will need to be made by policymakers as to whether the credit will be available to just C corporations or if pass-through entities will also qualify. R&D type credits are generally non-refundable, but this may reduce the value of the credit to startup firms that might not have any taxable income that could be offset by a credit.
- Another option would be to make this a certificated credit. If this were a certificated credit, firms would have to apply for the credit and be approved by a government agency, rather than the credit being available to every firm with eligible activity. In this way, the credit could be used as a business attraction tool to be awarded with other incentives to businesses making location decisions. This would potentially allow for larger and more targeted credits, but it also would mean that many firms doing valuable R&D work would not be eligible.
- The cost of the credit is scalable. It will depend on the percentage of R&D expenditures eligible, which types of activity are included, which firms are eligible, etc.

The goal of the credit is to generate R&D activity that would not have occurred in the absence of the credit. To the extent this is successful, the credit should be designed to leverage private R&D spending.

This would also position the state better for federal grants. Many DOE, DOT, and DOD grants require the participation of the private sector and the basic and applied R&D supported by this credit could potentially qualify.

This credit would increase the return on investment for certain types of investment. This would be a helpful tool for business attraction. This credit could have an immediate impact by increasing R&D at new and existing firms and a longer-term impact if this R&D leads to breakthrough technologies that lead to additional investment and production occurring in Michigan.

A review of state R&D credits has not been completed. However, a recent analysis noted 36 states have some form of R&D credit, while 15 states, including Washington D.C., do not. Michigan does not currently have an R&D credit, but it used to. Under the Michigan Business Tax, taxpayers could claim a credit equal to 1.9% of R&D expenditures in Michigan, subject to limitations. The MBT was replaced with a corporate income tax (CIT) starting in 2012, and the CIT does not include an R&D credit.

An R&D credit has been available at the federal level since 1981. The federal credit is complicated and consists of four separate elements. For three of these elements, taxpayers can claim a percentage of qualified R&D expenditures above a base amount. This means taxpayers only receive a tax credit against the incremental increase in their R&D expenditures. The credit amounts range from 14% to 20%.

The federal R&D credit, Michigan's former R&D credit, and likely the R&D credits for most states are not limited to the auto sector but are available for R&D in any industry or for a broad range of industries. While a review of state R&D credits was not completed, some state R&D credits are known to focus on the auto industry. Wisconsin builds off the federal credit with a state credit equal to 5% of qualified R&D expenditures. However, the credit amount is increased to 10% for R&D relating to internal combustion engines and automotive batteries used in hybrid-electric vehicles. Oklahoma

provides a 5% credit for compensation paid to engineers in the vehicle manufacturing sector and 10% if the engineer graduated from an Oklahoma college. This is arguably a compensation credit rather than an R&D credit but given that many engineers are involved in R&D, it is worth noting.

Michigan needs to retain its top talent and is always at risk of losing this talent and the R&D it produces to another state. An R&D credit could help to keep R&D and the talent producing it in Michigan. This would ensure that innovation occurs here and would spur further economic development.

The state should capitalize a high-tech talent attraction and retention fund that could assist with reaching our state goal of growing Michigan's advanced mobility workforce by 15,000 by 2030

Michigan's working age population is expected to decline by 15% - about 771K residents - from 2007 to 2027. This data strongly suggests that the state's Sixty by 30 initiative (a goal set by Governor Whitmer that 60% of the state's labor pool obtain a postsecondary credential by 2030, and implemented through the Sixty by 30 Office at LEO) will not be successful unless we reverse the tide of brain drain. Conversely, there is a supply and demand mismatch for high-tech, computer science workers, specifically high-tech mobility and electrification workers. There is an estimated gap of approximately 12,000 tech-oriented mobility workers, and roughly 6,000 additional tech workers in other industries in which Michigan has a comparative advantage. This proposal intends to meaningfully contribute to Sixty by 30, while providing critical support to address acute talent shortages at the same time.

Michigan currently graduates more than 7,000 computer-science related degrees, but only retains 45% of them. Of these degrees granted, 1,500 are

estimated to be earned by out-of-state students, who are much more likely to leave. Michigan's net loss in migration was 19,373 in 2019. This program intends to stop the total loss in talent by one-third.

The state should capitalize a high-tech talent attraction and retention fund with \$50 million that could assist with reaching our state goal of growing Michigan's advanced mobility workforce by 15,000 by 2030.

By investing in the homegrown high-tech talent in Michigan, the state will be the place where the technology is created, and the workforce is grown. This fund addresses multiple challenges that Michigan and the wider mobility and electrification industry are facing: talent shortages, mobility tech workers leaving the state, and the growing need for higher-tech workforce due to technology advances.

There are three parts to this recommendation:

- 1 Create a Tech Talent Attraction and Retention Program that has a funding pool to offer "reverse scholarships" and a "remote worker incentive".
- 2 Scale up STEM forward: The MEDC recently invested \$1.5 million in placing Michigan STEM college students in internships at start-ups across Michigan. The program is facing tremendous demand and can be scaled up over the next three years to address this skills gap.
- 3 Create a statewide talent attraction and retention dashboard, conduct semi-annual surveys of targeted talent to understand how to better retain talent, and stand-up a statewide convening of regional talent organizations and other stakeholders, while providing targeted regional support.

To implement the program, the Office of Sixty by 30, in coordination with the MEDC, should partner with a third-party administrator who will be responsible for application intake, application processing, contracts with grantees, payment process and compliance. Once operational the program would offer remote workers \$7,500 to locate in Michigan, \$12,500 to locate in disadvantaged areas with two-year grant terms. Reverse scholarship awardees would receive \$12,000 total, dispersed over three years. Both programs would be targeted to computer-science occupations and degrees, and other high-tech mobility and electrification occupations experiencing talent gaps. Remote workers would have a minimum salary requirement.

Office of Sixty by 30 could reallocate programmatic funding depending on early program results between retention and attraction. It is estimated that the proposed funding level would pay programmatic costs for one-year of remote worker attraction and two years of reverse scholarships.

Estimates are that this recommendation would result in 3,000 tech workers attracted to or retained in Michigan, and 3,000 STEM interns placed at start-ups. Ultimate retention into full-time jobs is the goal.

This fund also leverages non-state funds and investments:

- STEM Forward requires a 1:1 private sector match by the start-up.
- Sixty by 30 would work to attain matching dollars for reverse scholarships from the University of Michigan and Michigan State University, where the gap between in-state and out-of-state tuition is sizable. Out-of-state students pay nearly \$150,000 more than in-state students in tuition at the University of Michigan.
- For remote worker attraction, communities that offer in-kind supports to make their community more welcoming will be prioritized for marketing (co-working space memberships, recreational experiences, discounts at local businesses, childcare accessibility, etc.). Utility companies have expressed interest in participating in the MEDC version of the program.

Retaining and attracting young talent contributes positively to community development as well. Michigan becomes a more enticing place to work and live when there is investment in college and post grad workers.

There would be an immediate economic and jobs impact as a result of STEM interns being placed as the program launches, and tech works attracted/retained would be realized over the span of the program and funding invested.

With COVID changing the way people work, many states have jumped on similar incentive programs to attract remote workers to their states with various incentives. Multiple states and local governments have similar programs- Hawaii, West Virginia, Maine, Iowa, Oklahoma, Kansas, Arkansas, Arizona, and Georgia.

The remote worker attraction program pays for itself through taxes in short order. The required minimum salary earned will pay taxes at the level of the grant within two years. The reverse scholarship and STEM forward program will also have a directly positive ROI, over a longer-term. In addition to direct ROI in taxes paid, Michigan will now be able to compete for business attraction opportunities that are currently being filtered out because of the lack of tech talent available.

The state should develop an EV Academy in partnership with postsecondary partner(s) that will ensure the mobility and electric utility industries a steady flow of skilled, EV-specific workforce

As the clean energy transition accelerates, creating a strong EV ecosystem in Michigan is vital to protect our competitive position as ground zero for future mobility. Having coordinated workforce development infrastructure is key to ensuring the local community is prepared for new in-demand jobs and empowered to participate in the continued economic growth of the region. It is also foundational to ensuring that the State is positioned to capture the exponential EV market growth that will occur in the next decade.

The recent OEM commitments to electric vehicles production can be seen as a great opportunity to further the electrification ecosystem as a whole, but there is cause for concern within the traditional automotive industry. "With fewer parts and lower mechanical complexity in their propulsion systems, EVs will significantly erode employment in the production of engines, transmissions, exhaust, and conventional fuel systems." Ford estimates that simplification in the assembly of EVs could lead to a 50% reduction in capital investments and a 30% reduction in labor hours compared with ICE manufacturing.

In order to remain ahead of this industry shift, the state of Michigan should invest in EV-focused training and reskilling as the needs of vehicle manufacturing change.

The proposed EV Academy will be focused on four main objectives to track success.

- 1 Rapidly accelerate EV-focused training and retraining efforts.
- 2 Grow the qualified mobility workforce and create simple onramps to EV-related jobs.
- 3 Bolster the EV talent pipeline to support attraction efforts and drive job creation.
- 4 Ensure equitable access to future mobility jobs.

The platform should be designed around four core pillars in order to achieve these objectives.

- 1 Centralized resources combined with decentralized administration to enable rapid implementation, achieved by:
 - o creating a central State-level platform that provides industry-validated training content, resources and services to drive workforce development across the electrification value chain;
 - o centralizing content and services will enable rapid adoption and scale capacity in order to close critical vocational and "white collar" skills gaps quickly;
 - o designing the platform to offer a range of modular curriculums that allow trainees to earn stackable credentials for in-demand skills;
 - o setting up management of the platform by a third-party firm selected through a competitive process and having the third-party firm be responsible for continuously evolving content and pedagogical methodologies to keep the platform current;
 - o building a network of local training partners (technical schools, trade schools, universities) to administer training through hybrid learning programs;
 - o having training partners that can adapt and customize the core platform content versus building new curriculums from scratch to support speed to market and lower implementation costs;

- o having a third-party manager capable of training the local partners as needed; and
- o potentially providing grants to training partners to cover working capital costs related to program set up, staffing, etc.

2 Public-private collaboration to ensure job-ready skills and seamless job placement pathways, achieved through:

- o working closely with industry to ensure training content and curriculums are aligned with employer-defined needs;
- o establishing a public-private task force to design a base curriculum tailored to specific future mobility job specs;
- o establishing a coalition of employers who commit to recognizing the EV Academy credentials and prioritize hiring EV Academy graduates;
- o having the platform offer an exclusive jobs marketplace that would allow trainees to easily apply to open jobs at coalition companies; and
- o partnering with coalition companies and labor organizations to create apprentice programs, which could include upskilling apprenticeship programs for high-potential employees in addition to new employees hiring programs.

3 Flexible customization to support attraction efforts, achieved by:

- o creating an “Academy as a Service” offering to bolster EV-related attraction efforts;
- o partnering with attraction targets to create customizable modules or learning pathways; leverage existing local training partners to launch and support programs or onboard additional partners to serve specific needs (geographic, specialization, etc.); and
- o potentially providing state incentives to offset costs related to the construction of physical training centers or facilities needed to support Academy programming.

4 Equitable access, facilitated through:

- o creating an Equity Scholarship program designed to ensure underrepresented groups have access to training and apprenticeship programs; and
- o leveraging incentives to catalyze matching private sector investments and diversity and inclusion commitments.

The EV Academy as recommended would be launched with a non-state of Michigan partner. Once a partner has been selected, the Academy will ultimately require an investment from the appropriate state agency.

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There is a lot of attention to electric vehicles in the major industries of energy and transportation. The critical next steps will be to translate that attention into practical steps to bring the benefits of electrification to Michigan workers by ensuring our workforce is adequately prepared. This report helps bring focus to that critical step.



Michigan should advocate for the creation of a federal commuter tax credit

Unlocking access to new, flexible mobility solutions is a key component to aiding many Michiganders in accessing employment and training opportunities. To help with the state’s general economic recovery from COVID-19 but also to promote advanced, on-demand and as-a-service mobility technologies and providers within Michigan, CFME recommends the state urge Congress to amend the current commuter tax credit to recognize new and flexible concepts of mobility. The current federal law under 26 USC 132 allows an exclusion from gross income on an employer’s federal taxes for providing commuter benefits to employees. The allowable benefits include transportation in a commuter highway vehicle, transit passes, qualified parking and qualified bicycle commuting programs. Allowing additional services and concepts such mobility as a service (MaaS) and mobility on demand (MOD) would give employees more options and flexibility in arranging convenient and accessible mobility to work. Under the change, employers would receive a tax benefit by recognizing these options as valuable in getting workers to the workplace reliably and conveniently. The different modes and providers would benefit from higher demand for their services and products.

ELECTRIFICATION

The electrification workgroup recommendations center around implementing new programs to equitably direct deployments of EV charging infrastructure, researching and developing data around key EV adoption and transportation electrification impact issues for use in future policy recommendations, and new policies and programs that target EV adoption in critical submarkets like medium- and heavy-duty vehicles.

Fund an incentive program for EVSE purchase and installation

The CFME recommends modeling and implementing tested and proven electric vehicle supply equipment (EVSE), or EV charging infrastructure, personal-use consumer incentive programs for both residential and commercial EV owners.

Michigan's communities must prepare and implement charging infrastructure to support two million EVs within the next 10 years. With many EV models becoming available and the rapid growth of EV sales, setting foundational infrastructure up within the next three to five years is imperative now to prepare for the longer-term vision. Michigan's leading automotive manufacturers are planning for a 100% electric sales future between 2030 and 2035. Complementary policies and programs are needed to ensure that communities across Michigan are able to benefit from this influx of electric transportation options. Carefully crafted programs to reduce the cost of EV charging deployment will not only speed EV adoption, but also support equitable access to EVs.

Existing incentives for EV charging, including those offered by EGLE and investor-owned electric utilities, have proved highly successful. However,

funding for both programs is limited. Long-term, fully-funded incentive programs can help scale the market efficiently and ensure that all Michiganders are benefiting from EV charging deployment.

The economics of installing, operating, and maintaining EV charging infrastructure are challenging at current levels of utilization. However, charging must be deployed today to increase consumer confidence in the electric vehicle market. Financial support for public and private investments in EV charging infrastructure are needed to spur early deployment in a manner that is both sufficient and equitable.

The CFME is recommending that Michigan establish a comprehensive approach to supporting EV charging deployment through the development of a state-wide rebate program for EV charging equipment, and a directive to utilities to propose scaled programs to support EV charging deployment. State-delivered rebates should be complementary.

A legislative vehicle could support development of incentive programs through two tracks:

- a state administered incentive program, and
- a utility administered incentive program, with oversight of the Michigan Public Service Commission (MPSC).

Michigan will need approximately 10,000 DCFC (i.e. Level 3) and 90,000 Level 2 chargers by 2030 to support two million EVs. Michigan should pass legislation that reduces the cost of EV charging deployment with the goal of achieving these targets. Financial support for EV charging can be driven through two mechanisms:

- the state should direct funding a state agency to develop a rebate for EV charging equipment. The rebate should be in addition to any funding offered by other public programs, including utility programs, and should include specific equity considerations for ensuring that charging is deployed in disadvantaged and underserved communities; and
- legislation should direct utilities to file EV charging program proposals with the MPSC, and the proposals should be scaled to achieve the level of EV charging necessary in 2030.

With meaningful utility engagement and with the right programs in place, transportation electrification and vehicle-grid integration can put downward pressure on rates with benefits for all. It is imperative for all stakeholders and consumers

in Michigan that rate cases and proposed utility investments be approached with an eye towards reducing emissions, improving reliability, and ultimately reducing rates to strengthen Michigan's energy competitiveness. A light duty EV (i.e. around a 70 kW battery) charging 70-85% off peak over its life would produce benefits between \$1,900 and \$2,300. The state Department of Environment, Great Lakes and Energy's PowerMIDrive pilot indicates \$2,100 in grid benefits per light duty EV.

A state offered EV charging incentive program could be used to direct federal dollars likely to be made available for EV charging in federal infrastructure legislation. Utility programs will leverage ratepayer dollars, with oversight from the MPSC. A framework for incentive delivery will put Michigan in a competitive position to receive dollars earmarked for EV charging deployment.



This recommendation also provides immediate economic and jobs impact. EV charging installation leverages local contractors and electricians, providing a guaranteed stream of installation jobs.

Michigan is behind when it comes to EV charging infrastructure, which is reflected in a recent American Center for an Energy Efficient Economy (ACEEE) state scorecard ranking of 29th, tied with Kansas and New Mexico.

To date, most state-run EV charging incentive programs have leveraged VW settlement funds. At least 27 states have developed grant or incentive programs for light duty EV charging equipment, totaling more than \$126 million in funding. Michigan has experience delivering this type of program through EGLE's Charge Up Michigan initiative. Other states have established incentive programs using general funds or revenues from carbon reduction programs. For example, the state of New York funds a workplace charging incentive through NYSERDA's Charge Ready NY program.

Utility pilots and programs to support EV charging have been approved in 30 states, totaling more than \$3 billion. In California, legislation directed utilities to establish permanent make-ready programs. In Connecticut, regulators are considering a 9 year program designed to incentivize at least 50% of the total EV charging ports needed to meet 2030 EV adoption goals. Presently, Michigan is behind many other states on EV investment, including California, New York, New Jersey, Colorado, Massachusetts, Maryland, Oregon, Virginia and Minnesota.

It is important that a state program place a clear focus on directly supporting low-income and disadvantaged communities, as well as those that might be more difficult to reach and therefore tend to be underserved (e.g. multi-unit dwellings, rural communities).

An EVSE incentive program is a factor considered in states' "EV-friendliness" factors used by industry to compare potential locations for future EV manufacturing operations. If Michigan does not pursue a statewide EV charging program, there is a risk that an electrified transportation industry and its supply chain moves to other states and countries. There is also the risk of poor driver experience if EV charging is not deployed sufficiently, which would slow overall adoption. Electric vehicle adoption rates are another metric for a state's EV-friendliness. Finally, certain communities and market segments are likely to be underserved without focused incentives guiding charging deployment.

There will likely be concern that near term costs may exceed the economic benefits in the short term, and concerns about non-EV drivers supporting a mode of transportation they do not currently use. However, these risks should be mitigated by a clear vision of a highly electrified transportation sector in the future that ensures our leadership position as the automotive state as well as by the significant environmental benefits that will accrue. Rebates should also place a clear focus on mechanisms to reduce future costs, by future proofing and managing flexible load from EV charging.

There are also options for larger and smaller scale versions of the recommendation that would be useful:

- state incentive program could be limited to specific markets. For example, rural communities and charging that serves multi-unit dwellings, and
- the state could instead develop a tax credit for EV charging equipment. However, this only reaches individuals with a tax liability, once a year.

On the flip side of standing up an EVSE incentive program to bolster the state's EV-friendliness rating, the CFME recommends avoidance of public policies, like licensure requirements on charging operators that place unnecessary burdens on the still developing EVSE market and that would lower Michigan's EV-friendliness score. Such policies would inhibit Michigan's ability to maximize the state's share of the anticipated, massive federal and private investments in EVSE to come over the next few years.

Explore and pursue federal funding which may be provided with enactment of the Infrastructure Investment Jobs Act (H.R. 3684)

At the time of writing, the Infrastructure Investment Jobs Act has been passed by the United State Senate, after originally passing the United States House of Representatives in a different version. The latest, Senate-passed, version of the legislation would provide substantial federal funding for charging stations with an emphasis on alternative fuel corridors across the country. The final version of the legislation is far from settled and the state should not wait to make investments in EVSE networks, but charging station funding may be available for a significant effort in this regard. The CFME recommends Michigan policy makers determine how to qualify for these funds and for membership in such corridors when they serve Michigan's interests.

Study and determine both which EV consumer incentives will best increase equitable EV adoption in Michigan, and study the impact electrification will have on traditional transportation infrastructure financing systems

To help accelerate EV adoption in Michigan and support demand for EV manufacturers' products, the state should provision a study on the various

forms of EV purchase consumer incentives. The study should have a specific aim of expanding the EV market by penetrating sales barriers to lower income households. While the CFME did consider recommending the establishment of an EV purchase rebate program, it was determined prudent to first obtain data to ensure the state resources would be aimed intentionally at increasing EV adoption (and not at financing EV adoption that would occur without the incentive as previous programs have done). Concurrently, the state should study the effect of transitioning to EVs on the state's current transportation revenue sources (i.e. gas tax, registration fees) and the potential of alternative future infrastructure financing systems.

EV purchase incentives have a significant effect on total EV sales, particularly among lower- and middle-income consumers who may not be able to afford higher upfront costs, even though they will save money on fuel and maintenance (total cost of ownership). Currently, EV financial incentives help consumers make the switch to driving electric by narrowing the price differential between a traditional internal combustion engine (ICE) vehicle and an EV.

Twenty-three states have implemented some form of purchase incentives so far, and when ranking states' EV leadership, private entities (such as American Council for an Energy Efficient Economy or ACEEE) score financial and nonfinancial deployment incentives as the most important factors.

As seen in these other states, consumer incentives increase EV deployment. Implementing such an incentive program will demonstrate Michigan's commitment to electrification, and help support Michigan-based EV companies and EV manufacturing jobs while also decreasing

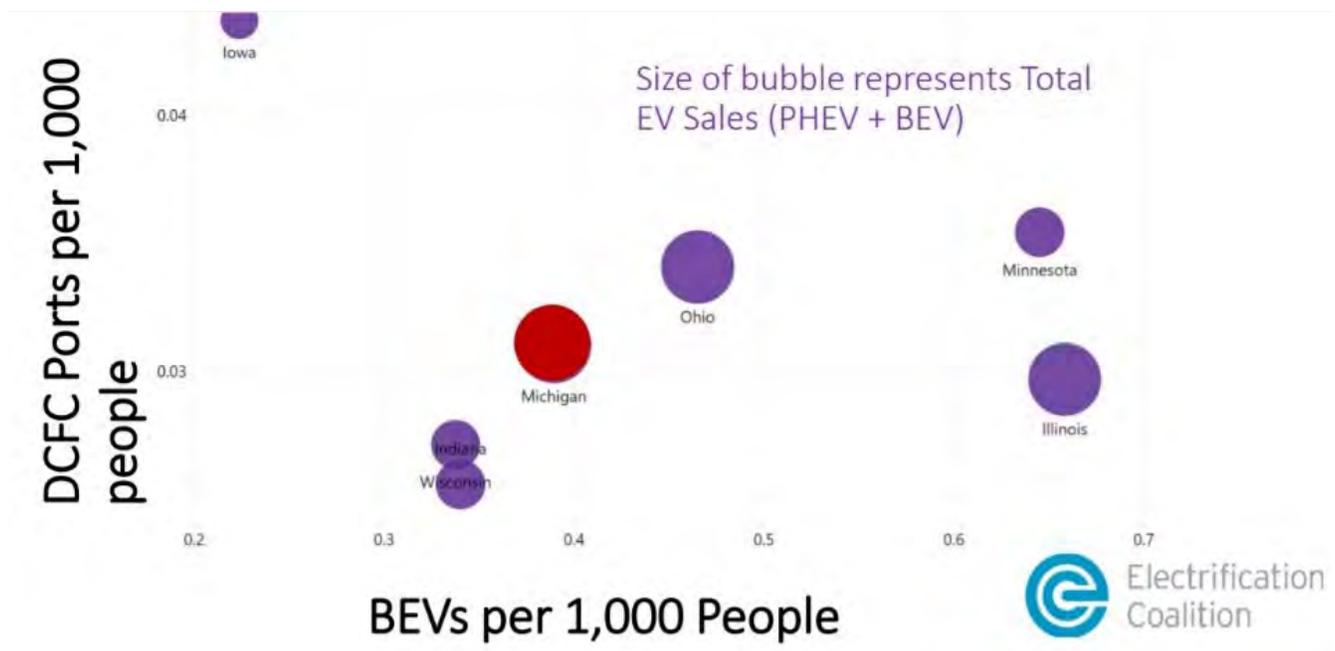
the state's transportation emissions of CO2 and criteria air pollutants. In addition, transitioning transportation fuel from out-of-state and out-of-country produced hydrocarbons in favor of Michigan-produced electricity will offer additional localized positive economic impacts.

Light-duty vehicles account for 58% of the state's mobile emissions of criteria air pollutants. With only 23,000 EVs sold in Michigan through June 2020, the state is ranked 16th out of 50 states, and with 2.4 BEVs sold per 1,000 people, Michigan is 25th out of 50 states. For Michigan to reduce air pollution and CO2 emissions, increased deployment of EVs will need to be encouraged.

According to the American Lung Association, widespread adoption of electric vehicles by 2050 would result in an estimated \$72 billion per year in health care savings nationally. In Michigan alone, the annual benefits would include \$1.7 billion in avoided health-impact costs, 145 premature deaths avoided, 1,837 asthma attacks avoided, and 8,253 lost work days avoided. By embracing efforts to speed the adoption of EVs in Michigan through the study of consumer incentives, best practices

as determined by other state programs should be taken into consideration, and clear programmatic goals should be defined. To ensure that the eventual policy is as useful as possible to all income-levels and taken advantage of by all types of Michiganders, equity and accessibility of any purchase incentives must be considered.

Currently, EV adoption in Michigan lags behind other states. In order to decrease the price differential between an ICE vehicle and an EV, and to increase EV adoption in Michigan, a wide variety of consumer purchase incentives can be offered by the state. Point of sale rebates are widely viewed as the most effective. To address equity concerns, some states have created additional incentives for those at a certain income level, set eligibility tiers or limits based on income or vehicle price (MSRP). Tax credits (similar to the existing federal credit) or sales tax exemptions can also be utilized. Additionally, used-EV incentives, which can take the form of a straight rebate can make EVs even more affordable to historically underserved communities and lower-income households. Some incentives cover both new and used vehicles.



The proposal recommended by the CFME is for a state study that reviews multiple models developed across the 23 states and many nations who have implemented purchase incentives and determine which one(s) would best fit Michigan's unique needs and interests. It has been proven that the most effective programs shared key characteristics: 1) available to both battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs), 2) are available close to the point of sale, 3) are offered to purchased and leased vehicles, 4) are available for company vehicles, 5) are durably locked into place for at least several years, and 6) are relatively simple for consumers and dealers to understand their value. The study should also evaluate best practices that enable lower-income consumers to participate in the incentive program.

There will clearly be a cost associated with implementing consumer incentives for EVs, which is why this study should also look at new revenue sources that EVs could generate. Other revenue sources utilized by existing state programs could include general funds, allocation of existing EV registration fees, utility funding, a clean fuels program, or a new user fee based on a vehicle's miles traveled (VMT). Individual incentives for qualified vehicles and purchases range from the Federal tax credit (\$7,500), the largest state rebate of \$5,000 (New Jersey) to \$200 (Orlando utility program).

The value of the increased adoption of EVs accrues in a number of categories: public health benefits (see ALA estimates above), avoided CO₂ pollution, local economic impacts resulting from swapping out-of-state and foreign produced oil for Michigan-produced electricity, as well as increasing productivity from Michigan-based EV OEMs.

1 A Clean Fuels Policy

Governor Whitmer has articulated clear and ambitious climate goals for the state. At the same time, Michigan's automotive manufacturers are investing tens of billions of dollars to accelerate the industry's transition to an all-electric future. Ensuring that Michigan has the policies in place to achieve its goals and support its world-leading auto industry in its transformation is vital. The reality is that other states are working hard to claim the mantle of EV leadership with broad and robust public policy toolkits at hand. Michigan should not miss an opportunity to provide its own, best-in-class policy environment.

To meet Michigan's emissions reduction goals while advancing the state's burgeoning mobility and electric vehicle (EV) industries, Michigan should establish a supportive and foundational policy environment that both begins to reduce emissions in the near term while laying the groundwork for and incentivizing a longer-term transformation in the transportation sector. Market-based approaches such as a clean fuels policy can achieve both goals.

To do this, CFME is recommending that the state study establishing a clean fuels policy that reduces the carbon intensity (CI) of transportation fuels used in Michigan over time, delivering emissions reductions and incentivizing investment in and greater use of low- and zero-carbon fuel alternatives, including electricity as a transportation fuel. In designing a clean fuels standard for Michigan, the state should consider how to improve upon existing approaches and maximize the benefits of the program, including policies to increase EV sales and regulatory provisions that

reinvest the proceeds of certain credit sales under the policy to support a point-of-purchase EV rebate for Michiganders, or other measure. The broad outlines of a clean fuels policy would likely be established through legislation, with certain design and implementation details developed and clarified through regulatory action to establish program rules.

A clean fuels policy can be an effective tool for reducing transportation emissions while driving economic growth and accelerating vehicle electrification. If Michigan acts now, it could also serve as a blueprint for other state programs across the Midwest or Great Lakes region, cementing Michigan's role as a climate and EV leader.

Clean fuels policies reduce transportation sector emissions while also marshaling additional private capital investment in EV charging infrastructure. (Because clean fuels policies support a portfolio of cleaner fuels, they also support jobs and innovation across several industries, including biofuels and renewable natural gas.) Just as importantly, with appropriate program design, revenues generated by the sale of credits under the program can be used to support EV purchase rebates that catalyze the EV market's growth.

Several states already operate clean fuels programs or are nearing legislative passage. British Columbia, California, and Oregon have established clean fuels programs. Washington passed legislation to establish a program in 2021 and regulatory development will begin this year. Minnesota and New York actively debated legislation in 2021 with strong and broad stakeholder coalitions in support. With bold and assertive action, Michigan could still become the first Midwestern state and first state outside of the West Coast to establish a clean fuels policy.

Michigan should learn from the experiences of states with already established programs. Charting a path reflective of the state's unique context, including its vibrant EV industry, could make Michigan a leader in maximizing the benefits of a clean fuels policy for transportation electrification. Creating more direct pathways for EV makers to earn and claim the credits their vehicles generate under these programs would be one possible reform, as well as more efficient administration of a potential EV rebate program, and clear program guidance to ensure that the full range of passenger EVs are eligible to benefit.

A clean fuels policy would establish a declining standard for the CI of transportation fuels used in Michigan to achieve a target reduction by a state-determined end year (for example, 15% below baseline by 2030). The CI would be measured over the full lifecycle of transportation fuels, accounting for oil extraction and refining in the case of gasoline or diesel, growing the crops used to produce biofuels, and power generation in the case of electricity. The state would need to determine the CI values used in its program. While CI calculation can be complex, Michigan could adopt CI values already vetted and in use under existing programs or look to those programs as a foundation for its own determinations.

Fuels with a CI above the standard would generate deficits while those below the standard would generate credits. Banking and trading mechanisms would allow deficit-producing entities to account for their shortfalls while creating financial opportunity for credit-generating entities.

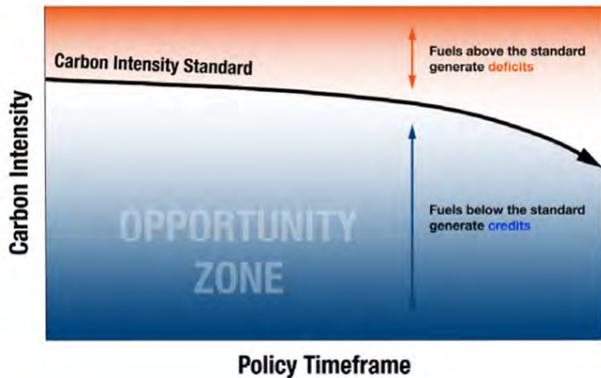


Figure 1: Clean fuels policies create opportunities for clean fuel producers to generate and sell credits. (Source: Great Plains Institute)

Credit values will be determined by the private market the policy creates. Under existing clean fuels policies, they trade for as much as \$200/ton. The state would establish a policy framework and regulations to govern the allocation of credits generated by a given fuel and any provisions governing how revenues earned from specific credit sales may be used - for example, requiring that revenues earned through residential EV charging credits fund a statewide EV purchase rebate.

Aside from administrative costs (the regulating state agency might require additional staff or resources to oversee the program once established), the fiscal impact would be neutral - a clean fuels policy neither taxes nor spends. The state could impose an administrative fee upon fuel providers to cover the costs of program implementation and oversight.

As there is no budget investment, there is no ROI. However, the state can expect to reduce carbon emissions from the transportation sector while accelerating growth in the market for alternative transportation fuels. This could support new job creation and economic activity in the state with

attendant macroeconomic benefits. Additionally, by creating a market, a clean fuels policy incentivizes private sector investments in clean fuels and creates new sources of value that can be captured or leveraged to achieve public goals (for example, steering certain credit revenues toward EV purchase rebates).

A clean fuels policy provides multiple positive impacts that are worth noting – greenhouse gas and air pollution emission reductions, likely new economic activity and job creation, and depending on the regulatory design, potentially targeted investments of credit proceeds in ways that advance equitable transportation electrification. Economic modeling of a potential clean fuels policy in Minnesota and Iowa found that a 10-year program would create almost 15,000 jobs, \$946 million in employment income, and contribute almost \$2 billion in regional gross domestic product.

Building and maintaining a broad coalition of supportive stakeholders across sectors is key for building political support for clean fuels policies. In states with active debates underway, the supportive coalitions span private industry (including automakers, biofuel and RNG producers, and charging companies), investor-owned and municipal utilities, and environmental groups. Demonstrating the clear and tangible benefits of clean fuels policies for public health, as well as the opportunities under such programs to extend the benefits of transportation electrification equitably to all communities, will also be important.

2 A Vehicle Miles Traveled-based EV Fee Pilot

As Michigan prepares to become a leader in vehicle electrification, the state must make sure that all of its policies align with accelerating the

EV market. Michigan's extra registration fees on electric vehicles have unfortunately been shown to result in annual road maintenance contributions that are, on average, significantly higher than those for conventional gasoline vehicles, thus potentially discouraging EV purchase, especially for lower-income residents. As a uniform fee, the state's current policy also does not reflect the mileage traveled on Michigan roads. The result is a fee structure that is sub-optimal. An alternative approach that would be fairer to EV drivers and in alignment with state goals regarding vehicle electrification is to assess EV registration fees that are more comparable to similar gasoline vehicles and based on actual miles driven.

The proposed Vehicle Miles Traveled (VMT)-based EV fee pilot would establish a program that EV owners could opt-in to that is based on a combination of appropriately selected vehicle's metrics and their vehicle miles driven. This would more accurately reflect road usage and the gas taxes that owners of gasoline vehicles pay today. The pilot would also explore different ways of measuring vehicle mileage, such as through onboard diagnostic devices and self-reporting methods.

In exchange for participating in the fee pilot program the EV's registration fee would be reformulated, lessened to be based on the equivalent vehicle efficiency of conventional gasoline vehicles. This would provide an option for EVs to pay the same total fees as a gasoline vehicle with comparable fuel efficiency and mileage. A straightforward approach to deriving vehicle fuel efficiency for EV's is to use a vehicle's EPA-assigned miles per gallon equivalent, or mpg(e), which is required on every new vehicle's window sticker. This efficiency value could then be translated into a per mile fee, which could function in a similar manner to Michigan's manufacturer

suggested retail price (MSRP) based registration fees.

The VMT portion of the fee would be based on the vehicle's mileage, which could be measured in real-time based on an onboard diagnostic device or after-the-fact based on odometer readings. A key objective of the pilot would be exploring these different options, assessing their cost and administrative burden, and value to the EV owner.

From an equity perspective, the per mile fee could include a floor value based on a minimum equivalent to the most efficient gasoline vehicles. This would ensure that increasing EV registrations does not shift the burden of road-funding to non-EV drivers. However, as gasoline vehicles continue to become more efficient as well, other interventions may be necessary to make up the gap, such as indexing the gas tax to fuel efficiency as the state have done for inflation. It is assumed that the EV per mile fee would be automatically adjusted to reflect these periodic adjustments to the fuel tax. In the end, as internal combustion engine vehicles become more efficient and are ultimately replaced by EVs, an alternative to the state's fuel tax will be needed to provide for road funding. This pilot offers a critical policy option.

Metrics for the pilot could include whether the pilot delivered on the goal of providing parity in fees with comparable gasoline vehicles, whether the VMT-registration fee combination is a feasible component of a future infrastructure financing system, and whether participants were satisfied with the program outcomes or administrative requirements.

The pilot would require a statutory change to allow participation in an alternative EV fee, and a potential budget investment to support the development of the pilot and any administrative costs associated with implementing it.

There could be a modest, negative impact on state revenues from lower EV fees, but anticipated increases in EV sales will likely offset those reductions due to the higher registration fees that are collected. Overall, a more friendly tax environment for EVs will be good for state revenues.

While difficult to estimate a specific ROI, a California survey found that a \$100 EV fee would reduce EV sales by up to 10%, thus reducing sales of higher-priced vehicles.

Study the efficacy of financial incentives to public transit agencies and school districts for fleet electrification and pilot vehicle electrification deployments

The transportation accounts for 32% of Michigan's CO2 emissions and Michigan ranks 10th of 50 states in total CO2 emissions and 30th in energy consumption for all sectors per capita. Public School Districts in Michigan operate over 16,000 buses across the state, traveling more than 163 million miles annually providing transportation for 48% of K-12 students. With an average fuel economy of 6.5 mpg, they have a significant impact on CO2 emissions. Converting the public-school

bus fleet to zero emission vehicles will improve the air quality in Michigan and provide a positive economic impact.

Transitioning from the “known” (fossil fuel buses) to the “unknown” (electric buses) is a daunting task that carries risk and uncertainties for public school systems that are facing staffing and budget challenges. We believe the state can, and should, help mitigate that risk and set school districts up for successful conversions to zero emission, electric fleets. If successful, the learning gleaned from the study and pilot can form the basis of a broadly scalable deployment of electric buses among multiple transit agencies in Michigan. In addition, deploying electric school buses in districts serving lower income communities provides an important environmental justice benefit of improving quality of life.

The CFME proposes the following: to facilitate the state's electrification strategy for medium- and heavy-duty vehicles, separate and particularly designed grant programs should be offered via the Michigan Department of Transportation (MDOT) to public transit agencies and school districts for the procurement of EVs, and the programs' outcomes should be studied for efficacy.

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The electrification of medium- and heavy-duty vehicles, particularly fleets, will improve air quality, drive battery innovation, mitigate carbon emissions, and soon could allow these vehicles to act as distributed storage resources that can help businesses and communities be more resilient in the face of extreme weather events and other disasters.

TREMAINE PHILLIPS | MPSC Commissioner

To do this, the CFME is recommending a feasibility study and electrification pilot plan for public school systems and public transit agencies in Michigan and will provide accessible, electric/FCEV school buses, charging infrastructure, and hands on assistance to public school districts and transit agencies across the state. It will also provide training for transit system staff to ensure they understand how to properly maintain and operate electric vehicles and charging infrastructure. Additionally, it could include pilot projects for renewable energy systems (e.g., solar panels with storage grids) to power not only the fleets but also the full system operations. The lessons learned will be used to ensure successful conversion to a carbon neutral transit fleet in Michigan.

This project will provide 40 or more accessible, electric transit vehicles, charging infrastructure, and hands on assistance to 15 to 20 of our school districts and up to 70 public transit agencies across the state. The participating school districts and public transit agencies should be determined using factors such as equitable distribution of benefits both geographically and socio-economically, system's interest in and capacity to participate (staffing, infrastructure, service area), variety of vehicle types (small, medium, and large buses, as well as vans), and variety of electric utility partnerships.

To support the school districts that are a part of this project, working groups will be created for Michigan school district engagement where best practices, lessons learned, and guidance is shared.

To support the transit agencies that are a part of this project, a partnership between the Michigan Department of Transportation's Office of Passenger Transportation (MDOT-OPT), local public transit agencies, and CALSTART would be formed. CALSTART is a national nonprofit organization with an office in Troy, Michigan, that works with its over

280 member companies and agencies to build a high-tech clean-transportation industry that creates jobs, cuts air pollution and oil imports and curbs climate change. CALSTART has a proven track record for success operating bus electrification programs in Michigan.

The assistance from MDOT-OPT and CALSTART will include selection of routes/service areas, vehicle and infrastructure assessment and guidance, placement of charging infrastructure, determining the feasibility of integrated battery and renewable energy systems, and assisting with the implementation training for staff, and assistance with the procurement of buses and infrastructure. MDOT-OPT and CALSTART will also administer the working groups, conducting quarterly meetings for each working group to discuss operational challenges and successes, as well as share best practices, develop knowledge products, and solicit presentations from Subject Matter Experts (SMEs).

The project will inform the deployment of electric buses and infrastructure for the remaining agencies and will assist OPT in developing a plan to move the public transit industry towards a carbon neutral future. All lessons learned will be captured and organized to inform future deployments and spread the benefits of the project to a broad base of Michiganders.

CFME is recommending a minimum budget investment of \$36 million for the purchase of equipment, feasibility and strategic planning, hands-on training and training modules, technical support, administration, and optional renewal energy system pilot projects, with the ability to scale the program if up to \$45 million were made available. While this will cost the state money to deploy the initial investment, school districts and the state will benefit from lower operating and maintenance costs, and reduced emissions from the use of electric vehicles.

The value of the increased adoption of EVs accrues in a number of categories: public health benefits, avoided CO2 pollution, local economic impacts resulting from swapping out-of-state/out-of-nation produced oil for Michigan-produced electricity, as well as increasing productivity from Michigan-based EV OEMs. In addition to the environmental benefits, transportation electrification is of strategic importance for the state as it directly creates new opportunities for economic development and job growth (directly and indirectly); training, manufacturing, research, design, engineering, testing and validation. This pilot could also leverage limited federal incentives from the EPA (DERA) which supports electric school bus upgrades of up to \$65,000 per vehicle.

Additionally, the federal reauthorization of the surface transportation act is under active debate in Congress. The final version is uncertain, but at least one version has included a provision for zero-emission bus grants which providing \$4.085 billion for fiscal year 2023 (FY23) through FY26 and dedicated funds for states and transit agencies with accelerated fleet conversion plans. This version would require an agency plan for long term zero-emission bus needs and a fleet transition study.

If the state budget impact is a concern, this project can be scaled to reduce the number of buses deployed and the additional elements such as renewable energy systems, strategic electrification plan, and training modules. EVs are not yet proven to be effective for every type of service across every size of vehicle required for effective and efficient provision of transportation services. We strongly view this proposed level of pilot program as being the preferred funding amount for purposes of providing the data and a better understanding where information currently is lacking, given the variety of communities the program would be able to reach without unnecessarily duplicating

data results. Additionally, the current industry that supports fossil fuel components used on buses and vendors of these fossil fuels will be impacted by electrification, and this pilot program would provide helpful knowledge as to the severity, reach, and timing of that impact.

Expand the eligible uses of school district sinking funds

Statutory limitations on the permissible expenses of school districts' sinking funds should be expanded to include EV buses when associated with a traditionally permitted capital outlay project, specifically the development of make-ready electrical infrastructure and electric vehicle supply and service equipment (EVSE) installation.

Sinking funds are accounts owned and operated by school districts in which they are allowed to raise local millage revenues for capital improvements and land acquisition. State statute limits permissible expenditures from these funds to only land purchases, school safety improvements, technology improvements, and the repair and construction of school buildings. There are school districts that have sinking fund balances, but either have no plans or no need for land acquisition or capital outlay projects or the fund balances are not enough to be used for those purposes. Meanwhile districts do have a need for transportation vehicles (buses) but cannot use the funds for those purposes.

Adding EV school buses to the permissible expenses list of sinking funds will both build more demand for EV buses as well we act as an indicator to bus manufacturers that Michigan is developing more friendly EV policies.

The CFME is recommending a statutory change by amending MCL 380.1212 to allow sinking funds to be used for the purchase of EV buses for pupil



transportation. If the legislature is resolute on keeping with the traditional purposes of sinking funds (i.e. financing capital outlay or technology upgrade projects) the purchase of an EV school bus could be allowed by statute only when in conjunction with the installation of EVSE or make-ready infrastructure. Additionally, previous attempts to expand the permissible uses of sinking funds to include transportation vehicles have expressly excluded bus driver salaries.

The state budget impact for this recommendation is revenue neutral. However, this could help Michigan school districts with the required matching funds needed to apply for private, federal, and state-Volkswagen-settlement-funded electrification programs. It could also help with expanding the reach of the school bus electrification pilot recommended in this report. This would better position Michigan school districts to draw down more of the \$7.5 billion proposed by the Biden Administration for school bus electrification.

This could help improve the fiscal health of Michigan school districts by offloading some transportation costs from operational budgets onto sinking funds. Electric buses also have fewer components and longer useful lives, resulting in potential cost savings to school districts on transportation maintenance.

There are also revenue options for school districts by transitioning to EVs through vehicle-to-grid (V2G) and vehicle-to-building (V2B) technologies and battery storage/emergency demand response opportunities. A V2G or V2B bidirectional power flow can allow a school district to avoid peak-demand energy costs and power school buildings with energy stored on the bus batteries. Districts could also, potentially, enter into agreements with utilities to respond to energy emergencies by deploying the school buses to charge key community facilities during power outages (i.e. hospitals, police and fire departments, senior homes).

Additionally, pupil transportation would have lower carbon emissions, helping improve local air quality and positively impact pupil and school personnel health, which has a derivative positive impact on academic performance. “[S]tudies of the effects of retrofitting diesel school buses with improvements that reduce emissions — a cheaper, short-term alternative to electrification — have shown that retrofits can help increase test scores at a much lower relative cost than reducing class sizes. These benefits are particularly important for the 6.1 million children with asthma in the United States.”

REGULATIONS, INSURANCE, AND PUBLIC SAFETY



The policy recommendations of the workgroup covering regulatory, insurance, and public safety issues focus on creating and marketing a tool for use by Michigan local governments to understand and adapt their local regulatory authorities to be prepared for drawing down and deploying federal investments in EV charging infrastructure, and researching and developing enhanced state cybersecurity regulatory policies that will facilitate a safer, more responsible advanced mobility and electrification future for Michiganders.

Develop and market an EV-Ready Community Playbook

Michigan's communities must prepare and implement charging infrastructure to support 2 million EVs within the next 10 years. With many EV models becoming available and the rapid growth of EV sales, setting foundational infrastructure up within the next 3-5 years is imperative now to prepare for the longer-term vision. EV charging infrastructure is much cheaper if incorporated into new construction activities than as stand-alone retrofit projects. However, retrofit work will be needed and thus optimizing where those retrofits occur is critical to maximize investment dollars.

To assist with the adoption of EVs as well as to prepare Michigan communities for both the future of transportation and to maximize greatest advantage of the anticipated massive federal government and private investments in EVSE, the state should develop an EV-Ready Community Playbook that local governments can utilize to model local regulations and land use policies and identify partners and funding opportunities for EVSE deployment.

To do this, CFME is recommending that the state establish a local government planning guideline playbook for Level 3 (approximately 30 minutes or less of fast charging), Level 2 (overnight and convenience charging) and Level 1 (long term parking and micro-mobility) charging locations and specifications. The playbook could also craft building code changes and suggested targets for contractors of new construction to incorporate EV infrastructure at much lower costs than retrofits, understanding that these are promulgated at the state level. CFME is recommending that the Michigan Bureau of Construction Codes and the Department of Licensing and Regulatory Affairs update the Michigan Uniform Energy Code and the Michigan Residential Code to require EV readiness for new construction. It is less costly to install EV infrastructure at the time of construction than it is to install retrofits later, which makes it easier for businesses and families to access EV charging.

The Rocky Mountain Institute projects that by 2030 approximately 10,000 DCFC (i.e. Level 3) and 90,000 Level 2 chargers would be needed in Michigan to support 2 million EVs. Establishing community planning guidelines for electric transportation along a similar bell curve of infrastructure use case placement optimization for Levels 3 (~10,000), 2 (~90,000) and 1 (~10,000) would provide valuable guidance regarding new construction and community planning standards.

This is a no-cost recommendation that will set the state up for success when it comes to implementing and installation EV charging infrastructure.

Michigan has an opportunity to lead in this project, as no other statewide guidebook is known. Some communities have developed guidebooks, but they tend to be specific to that community as opposed to an over-arching guide for multiple different community scenarios. That said, there are some



Communities across Michigan and the country are wrestling with many questions about how to accommodate electric vehicles within their fleets, and to prepare infrastructure for the widespread EV transportation needs of residents and visitors. The EV ready community playbook noted in this report will be a very timely and welcomed tool for these communities to avoid missteps and prepare most effectively.

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formatting and outlines that can be gleaned from the city-level examples. Michigan is behind in the installation of EV chargers, and creating the playbook allows communities across the state to implement the infrastructure in their locales. The playbook would also position the state and its political subdivisions better for federal grants, as a coordinated plan and investment guidebook will enable the rapid development of federal grant applications and deployment of funds.

The EV-Ready Community Playbook will address all aspects of EV planning that communities need and provide guidance on different strategies to better tailor transportation electrification investment per the community's aspects.

Immediate economic and jobs impact would come from the labor required to install the infrastructure. Because this is a statewide guide, it would also become easier to target underrepresented and disadvantaged Michigan communities.

Without a planning guide or updated building codes, development is likely to be ad hoc and potentially not consider all aspects of society and transportation.

Develop cybersecurity protection guidelines for state contracts covering infrastructure assets

The CFME recommends that Michigan should develop standard language for cybersecurity protection of infrastructure assets in state contracts. While state government may not be able to impact the design of CAVs or EVs, it is able to ensure the connected operating environment the state of Michigan is developing for Intelligent Transportation Systems, connected roadways and Smart Cities is inclusive of cybersecurity standards and requirements to increase the cyber resilience of these networks, products, and systems.

In an increasingly connected world, our society is sprinting toward a future of advanced transportation mobility, Intelligent Transportation Systems (ITS), electric vehicles and other evolutionary and technological changes, complete with Smart City infrastructure as an operating

environment for public transportation, passenger vehicles, and autonomous air and ground systems, and a plethora of Internet of Things (IoT) devices communicating with each other. This level of interconnectivity introduces cybersecurity concerns with every new device and technology integrated into these operating environments. This policy recommendation propels Michigan's reputation not just as a leader, innovator and advocate of future technologies but demonstrates a holistic understanding of how these technologies work and for the cybersecurity vulnerabilities present in the architectural design of each technology application. It will position Michigan as a continued thought-leader in this space and will contribute significantly to leading the way for states to generate a cohesive and collaborative plan to increase the cyber resilience of these systems-of-systems and to mitigate unintentional or intentional cybersecurity risk.

Creating policy focused on the implementation of cybersecurity requirements into state of Michigan acquisition protocols in ITS for CAVs, EVs, and connected critical infrastructure would position Michigan as one of the first states to create a cybersecurity position which harmonizes with the guidance provided by the United States Department of Transportation ITS Joint Program Office (JPO).

The state would create a cybersecurity policy for the advancement and security of Michigan's critical infrastructure for future mobility. This policy recommendation would include or create a standard by which the Department of Technology Management and Budget (DTMB) would issue RFPs and contracts pertaining to acquisitions of equipment integrated into MDOT managed roadways. Types of equipment likely to be impacted would include but not be limited to: Computer aided dispatch, MaaS platform, Contactless Fare software equipment, state-owned vehicles, infrastructure for roads including embedded code such as traffic lights, public transit options, and road signage emitting Radio Frequencies (RF). This policy language would ask vendors to test and validate the security of their products prior

to procurement by the state of Michigan. This policy would also direct the state to determine a way to manage, test, and validate cybersecurity of these products throughout the product lifecycle. Leveraging existing state programs such as the Michigan Cyber Civilian Corps may provide an initial, low-cost means to support the effort.

The proposed policy may require a statutory change and/or an executive order. It most certainly will require administrative action, a state budget investment, advocacy and, over time, a public awareness effort.

This recommended policy would require state agencies such as the Michigan Department of Transportation (MDOT) to coordinate with the state's primary procurement agency, the Department of Technology, Management, and Budget (DTMB), to incorporate cybersecurity guidelines and requirements into the state of Michigan's sourcing documents (i.e., procurement process) for networks, products, technologies integrated into Michigan roadways and interfacing or connecting with CAVs, EVs, or critical infrastructure.

This recommendation is anticipated to have a negative revenue impact to the state. However, security of any sort costs money as opposed to being a revenue generator.

The intrinsic value to the state of Michigan is to mitigate cybersecurity risks which may impact the physical safety and well-being of the citizens of Michigan, protect their Personally Identifiable Information (PII) while also safeguarding the state-owned infrastructure and networks from cyber-attack. Achieving success on these fronts could easily offset any upfront costs to the state for implementing the policy.

Additionally, this policy would likely to position Michigan for additional federal grants to protect critical infrastructure from cyber-attack. Depending on the specific type and structure of the cyber requirements, an economic impact may result in additional jobs in the State of Michigan, either directly or indirectly (i.e. testing, validation, and contract compliance career fields).

Critical infrastructure of all sorts has been the target of varying cyber incidents. Connected ITS infrastructure is a relatively new technology and, once massively deployed around the country and across the globe, these same technologies will become increasingly vulnerable to a cyber incident. The safety and security of people may depend on developing policies such as these.

The recommendation of this policy to lay the groundwork for initial cyber requirements associated with ITS systems and products. Over time, these requirements may increase or fluctuate depending on advancements in technology and the methodologies and frequency of cybersecurity incidents. It is recommended that for now Michigan begin on the smaller scale, taking fullest advantage of being one of the first states to advance such a mission.

The state should analyze other states' cybersecurity laws and regulations in order develop scope and methods for CAV data management and protection

The OFME and MDOT have already initiated this CFME policy recommendation by performing a research project on other states' cyber related legislation. Surprisingly, there are few bills in other states regarding cyber security in vehicles specifically. Research indicates only two bills in Arizona are currently pending in the US. The same

research showed a half dozen public acts since 2017, but these provide only modest examples.

- **Arizona:** Two bills have been introduced and are pending in the Arizona legislature. Both appear to penalize people who install “defeat devices” on automated vehicles with the goal of circumventing technology that monitors the driver alertness. H 2007 also penalizes altering physical or software components, but exempts manufacturers, researchers and certain maintenance workers. H 2007 remains in the first House committee. H 2083 has the same prohibition on installing defeat devices. It also exempts manufacturers, researchers and more categories of maintenance workers than H 2007. One key difference is that H 2083 applies to vehicles with level 2 and level 3 automation. H 2007 applied to vehicles with automation from level 2 to level 5. H 2083 has advanced from the Arizona House to the Senate.
 - **Florida:** Act 2019-115 is a major spending bill covering numerous state agencies and purposes. There are only a few cyber security provisions in the bill. The bill appears to appropriate \$6,450,000 to the University of Florida’s Florida Cybersecurity Initiative, but does not outline the research or activities of the initiative. An appropriation is also made for cybersecurity support at the Florida Atlantic University, but no further explanation is given. This same university also has the Advanced Mobility Institute. Finally, appropriations are made in the Department of Education budget for many STEM purposes including cybersecurity. Cybersecurity per se, let alone cybersecurity related to mobility, is not broken out in budget detail.
 - **In other spending:** the Florida Department of Transportation is given funding for seaport security technology and gaps, situational awareness and tools for cyber technology security. There are a few appropriations elsewhere in department budgets for contracts with private organizations for verification and validation of security systems. Other programs such as the Law Enforcement Data Sharing and sustainment of function may have cybersecurity implications. Funding is provided for “cyber incident response” and “sustainment of function” also receive modest appropriations of less than \$250,000 apiece. States and the federal government are realizing cyber security implications across their services and programs, and are considering specific attention or protections.
- Florida has also enacted Public Act No. 43 of 2019 providing for “corridors of regional economic significance.” It includes references to “connectivity” as well as to connected vehicle technology.
- **Michigan:** The database returned Public Act No. 323 of 2018 which created the Infrastructure Council within state government. The council is given responsibility to assess and provide recommendations in several areas of infrastructure. Among these are “protocols to ensure data security and accuracy at the local, regional and state level.” The council is also supposed to do an “asset criticality and risk analysis” which could include cybersecurity issues.
- A Michigan example of cyber legislation comes from 2017 when Senate Bill 927 and Senate Bill 928 were debated but ultimately not passed. Senate Bill 927 would have established a scale of penalties for damaging or disrupting electronic communications between vehicles

and infrastructure. The penalties were based on Michigan law penalizing carjacking. A modest initial penalty is provided, but the scale rises to life imprisonment for violations which result in the death of a person. Senate Bill 928 would have amended the sentencing guidelines law to reflect the penalties in Senate Bill 927.

- **Utah:** Public Act No. 479 of 2019 was enacted to provide for a pilot road user charge system. Within that system, “data security and privacy” (including personal information) are to be considerations. The privacy of location information (presumably of motorists) is also supposed to be safeguarded. It is possible, or even likely, that these specific provisions were

included for reassurance that the user charge data would not be used to track individuals.

- **Georgia, Oregon and Wisconsin:** The database returned acts for each of these states in the cybersecurity search, but the acts provided only described programs like vehicle electrification, vehicle platoons or related mobility topics without mentioning cybersecurity explicitly. It is possible the implementation of those acts will include cybersecurity, but there does not appear to be specific provisions for that. For reference, the public acts are: Georgia Public Act No. 214 of 2017, Oregon Public Act No. 93 of 2018 and Wisconsin Public Act No. 294 of 2018.

Overview of Section



In the CFME’s report published in February 2021, the council provided a survey of the mobility and electrification landscape in Michigan in an attempt to itemize the presence and concentration of the private and public mobility assets, investments, plans, and projects. This effort is helpful to do on an ongoing basis to both continually assess a rapidly changing environment and to provide a metric for the CFME’s mission to help keep Michigan a global mobility and electrification leader. It is also critical for CFME, as an advisory body, to understand where the mobility and electrification sector’s changes are occurring and at what pace to assess and accurately predict obstacles to the state’s frontrunner status that may lay on the horizon. While much of what was included in the February report is still accurate, there have been some alterations over the last eight months to account for and additions to make to the total Michigan mobility and electrification picture.

Additionally, there has been significant momentum on EVs, advanced mobility infrastructure investments, and support for the American automotive industry from the US federal government since the CFME released its last report. These shifts in national public policy will have a massive impact on Michigan’s mobility and electrification ecosystem. The White House’s 100 day review of critical supply chains offers a strong assessment of gaps in US manufacturing supply chains, particular for EVs, and how vital it is to build up domestic capacity. In addition to batteries, the report addresses critical mineral and semiconductor supply chains that are vital for auto production. The Biden Administration also announced in April 2021 new grants for deploying EV charging stations as well as new funding opportunities for EVSE research and development work. President Biden then signed an Executive Order in August 2021 setting a new national target to make half of all new vehicle sales be electric by 2030.

Status of MI's Mobility and Electrification Industry and Non-State Mobility Assets

Last February the CFME report indicated that Michigan was home to 24 automotive original equipment manufacturers. Today that number has grown to 26. Ninety-six of the top 100 automotive suppliers have a presence in Michigan and 60 are headquartered here. The sector's contribution to the state economy is now \$304 billion, up from our previously reported \$225 billion a few months ago. Michigan now accounts for 18% of all U.S. vehicle production, and 12% of North American vehicle production, and makes 16 different vehicle models, while employing 1.1 million jobs – representing a whopping 20% of all Michigan employment.

The COVID-19 pandemic had an affect on global supply chain, as did the Ever Given's blockage of the Suez Canal. American automotive jobs stymied as a result and are still rebuilding as vaccination shots jab arms and automotive grade chip production ramps back up. As a result, from 2019-2021 the sector job count is down 16%, but anticipated to rebound soon. The state is not alone in this affect, but continues to press an advantage in the concentration of engineers, still 3rd in the US, and in engineering degrees awarded by state institutions. The state also attracted \$558 million in private, venture capital funding during 2020 (down during the COVID-19 pandemic from \$771 million the previous year).

Ford Motor Co. will have invested over \$30 billion in electrification by 2025. Ford expects EVs will be 40% of its global sales by 2030.

In May 2021, Ford announced it was renaming its Van Dyke Transmission Plant to Van Dyke Electrical Powertrain Center. Ford recently invested \$150 million in the plant to retain 225 jobs. The plant will produce electric motors and electric transaxles for Ford EV, including the 2022 F-150 Lightning. This is in addition to the \$700 million investment made in the company's Rouge complex to build the all-electric Ford F-150 itself. The new EV products and investment were part of the most recent round of UAW-Ford negotiations in 2019.



In July 2021, Ford announced it will locate its global battery center in Romulus, MI, investing \$100 million in developing, testing, and building vehicle battery cells and cell arrays.

In June 2021 General Motors Co. Announced from its Detroit-based world headquarters that it is increasing its EV and AV investments through 2025 to \$35 billion. This is a 75% increase from the company's initial commitment announced before the COVID-19 pandemic. GM also announced an agreement with Dubai to deploy up to 4,000 self-driving Cruise Origin taxis by 2030.

GM has also launched the redesigned Chevrolet Bolt EV and new Bolt EUV this summer. The automaker has invested \$402 million in the Orion Township, Michigan assembly plant to produce the Chevrolet Bolt EV and Bolt EUV, bringing 400 new jobs. In total, the plant supports 1,100 jobs.

Following up on the previously noted \$2.2 billion being invested by GM to retool the Detroit-Hamtramck Assembly Center into Factory ZERO – the first GM plant to be 100% devoted to EVs – the anticipated jobs number for the site is now known to be more than 2,200 new positions. This site will help produce the new, high-volume battery-electric Silverado, which is being made for both fleet and retail customers, with an internal estimated 400 miles of range on a full charge for certain configurations.

GM has announced a second GMC HUMMER EV model – the GMC HUMMER EV SUV – which will also be made at Factor ZERO. The EV will feature in-house developed, software-driven technologies, including CrabWalk, Extract Mode and many more industry-leading features.

To support the production of multiple EV products, GM is investing \$40 million into its Pontiac Stamping facility in Pontiac, Michigan for the installation of Flexible Fabrication manufacturing.

The company has unveiled numbers of other EV and advanced mobility vehicle models, technologies, and business services over the past several months as well. General Motors also recently established a \$25 million Climate Equity Fund, dedicated to helping close equity gaps in the transition to electric vehicles and other sustainable technology, and published its 11th annual Sustainability Report, providing an overview of the company's environmental, social and governance (ESG) performance in 2020 and outlining new environmental sustainability goals for the next chapter of GM's work toward a zero-emissions future. GM also announced from its Detroit headquarters a new initiative that the entire, global corporation will become carbon neutral by 2040.

Stellantis will invest over \$35.5 billion on electrification and software from 2021 through 2025. In the U.S., Stellantis forecasts over 40% of U.S. light-duty sales to be electrified low-emission vehicles – including EVs and PHEVs – by 2030. Stellantis has made significant investments in southeast Michigan, including a new product lines for the Warren Truck, Jefferson Assembly plant and the new Detroit assembly plant which will make the all-new Jeep Grand Cherokee and Jeep Wagoneer models. Since announcing those investments, the company released the first images of the all-new 2022 Jeep Grand Cherokee 4xe plug-in hybrid.

Stellantis has also announced a \$1 million community initiative to be invested near its Detroit Assembly plant to improve the environment in the local neighborhoods.

Michigan has been the home for Toyota's U.S. R&D operations for 42 years and employees nearly 2,000 people. This year Toyota renewed its Michigan investments in the American Center for Mobility, University of Michigan (for Mcity and research projects), and the Collaborative Safety Research Center.

Toyota also helped create the FAME AMT program, a unique skilled workforce program in the state, and it makes annual financial contributions to help improve mobility in the southeast Michigan community.

In February 2021, Daimler Trucks announced a \$20 million investment in its Detroit, MI facility to make its new line of ePowertrain components for Freightliner trucks.

Testing

The American Center for Mobility (ACM) in Ypsilanti, Michigan continues to be a world-leading AV testing facility, and is expanding its interest in both scope and location. ACM is working with the UofM Center for Connected and Automated Transportation (CCAT) to demonstrate augmented reality technology with naturalistic and adversarial driving environments. ACM has also expanded its footprint more into southeast Michigan by working with the state and other private partners on a new Smart Parking Lab in Detroit's Corktown district (see below for more information).

Michigan Technical University (MTU) is home to a massive testing facility that spans over 900 acres and offers extreme ice and snow cold-weather testing environments. Michigan Tech is pursuing numerous research and educational projects around testing and using new mobility technology.

Along with Stellantis, General Motors and the American Center for Mobility, MTU is moving into Phase II of the US Department of Energy's "NEXTCAR" program with the goal of reducing passenger vehicle energy consumption by 30%.

The MTU "Tech Forward Automated and Intelligent Systems Initiative" is focusing the university's expertise in land and water environments to further the use of new mobility technology in meeting

specific research and development needs.

In cooperation with Ford, MTU is researching the use of acoustic sensor arrays to capture noises outside a vehicle such as sirens to enhance safe movement of an automated vehicle.

MTU is also using automated technology in automated water-surface vehicles to map the bottom of lakes in its ongoing Marine Autonomous Research project.

MTU students have been strong competitors in the annual General Motors/SAE Auto Drive Challenge to produce an SAE level IV vehicle. They captured second place in 2020 and third place in 2021, and have been the highest placing university in Michigan for three years.

Mcity at the University of Michigan is a public-private partnership that brings together industry, government, and academia to improve transportation safety, sustainability, and accessibility for the benefit of society. Since launching in 2014, Mcity has invested nearly \$30 million in over 50 research projects. Fifty research papers have been published based on this work, and 70 vehicle data sets. In July 2021 Mcity began its third three-year membership term. Before that, however, the testing center was hit by the COVID-19 pandemic just as much of the mobility industry had been. With the test facility closed during the early months of the pandemic, Mcity took advantage of the time to build a fake house inside the facility that can be used to test autonomous deliveries via cars and drones, explore accessibility solutions, and much more.

Mcity OS, a new cloud-based tool developed by Mcity engineers and introduced in February 2021, lets users design and execute complex yet highly repeatable test scenarios for connected and automated vehicles (CAVs), using any device

with an internet connection. Mcity OS can be licensed for use at test sites other than the Mcity Test Facility as well. The first license went to the American Center for Mobility (ACM) in Ypsilanti, Michigan.

A virtual demonstration of the Mcity ABC Test in June 2021 highlighted a potential methodology for proving the safety of automated vehicles before they are deployed or testing moves to public roads. Public trust in driverless vehicles nosedived in the wake of fatal accidents in early 2018, and persists today. The Mcity ABC Test was developed by Mcity and its industry partners in response to that decline. If adopted, the Mcity ABC Test could help rebuild public trust by answering a core question: How do you prove an AV is safe enough to operate on public roads? Here are five things to know about the Mcity ABC Test.

A2GO, an on-demand, autonomous vehicle shuttle service that will run in downtown Ann Arbor and between U-M campuses in the city, will launch in October 2021 as a collaboration among May Mobility, Mcity, Ann Arbor SPARK and others. Mcity will support the project, gathering data for a variety of uses. In addition, J.D. Power, an Mcity Affiliate member, will conduct a survey targeting riders and non-riders of A2GO to gauge consumer sentiment and trust about driverless technology. The survey will continue the work J.D. Power began with the Mcity Driverless Shuttle research project, with a new generation of service capabilities.

To date, over 120 students and 14 startups have participated in TechLab at Mcity, a company-in-residence program for early-stage, advanced mobility companies in the connected and automated vehicle space. TechLab is run by Michigan Engineering's Center for Entrepreneurship in partnership with Mcity. The program gives Mcity industry members a sneak peek at new innovations, great talent, and potential acquisitions.

Talent

As we think about the future of mobility, the University of Michigan is creating a future mobility innovation cluster. There are a number of strategic assets such as Mcity, the Michigan Battery Lab, the Ford Motor Company Robotics Building and the University of Michigan Transportation Research Institute. These assets create a robust foundation of research, public/private partnerships and provide differentiated assets for internal and external users.

In addition, the university is home to programs that include the Automotive Research Center, a modeling and simulation center of excellence in support of the U.S. Army; the Michigan Materials Research Institute and the Center for Connected and Automated Transportation to provide a few examples.

The university is also engaged in exciting work on novel electrodes, EVs and equitable transit.

Educating the next generation workforce is critically important. In addition to key disciplines such as Chemical Engineering, Electrical Engineering and Materials Science and Engineering, UofM has programs in targeted areas such as Energy Systems Engineering and Automotive Engineering.

Michigan State University is working on a variety of technologies and has significant expertise with more than 40 faculty actively engaged in mobility research. MSU serves as a one stop shop for technology, sociomobility and legal issues.

The university recently signed an agreement for an electric autonomous bus that will transport students from the commuter parking lot on south campus to the main part of campus. While addressing students' transportation needs by connecting them with other transportation modes or to central campus, this will also serve as a research data gathering exercise.



Further, MSU created a Mobility Advisory Council in April 2021, composed of mobility industry representatives to help guide the university's vision for the future of mobility. With experts from eight respected mobility-oriented organizations taking part in the Council, MSU is well positioned to gain valuable insight and perspectives of future industry and societal needs and the types of research and projects that MSU could support.

Faculty and students at MSU's Engineering College have assembled two autonomous, self-driving vehicles, one on a Lincoln MK Series platform and the other on a Chevy Bolt platform. These vehicles have been engaged in the development of some of the most cutting-edge algorithms for analyzing sensor images, sensing pedestrian intentions, fusing data from heterogeneous sets of sensors and implementing control systems, all in real time, both in good and inclement weather. Critical issues like software reliability and Cybersecurity are being studied with federal support and in cooperation with corporate partners.

MSU's campus is a living laboratory test bed for evaluating first mile/last mile issues with our pedestrian intense environment, known cycles of pedestrian and vehicular traffic and ability to modify campus and test environment. Campus intersections with HD cameras and Road-Side Units (RSUs) monitor, control, collect and analyze data gathered from these devices on a continuous basis. Campus vehicles are being outfitted with transponders to communicate with the RSUs for control as well as data collection purposes. This allows the campus to be used as a test bed/track not only to study vehicle dynamics but also vehicle/human interactions under realistic, relatively low-speed conditions found in urban environments. For earlier stage technology testing and evaluation, the university is repurposing a 350-acre site for a second test track with a significantly lower traffic density. This facility will be of value for automotive companies to evaluate their concept vehicles and early test prototypes. To push forward on robotics

and AI, MSU is evaluating self-driving robotic snow removers, grass mowers and indoor floor cleaners under real world conditions. All this activity will be centralized and visualized in a full-fledged Campus Mobility Operations Monitoring and Control Center which is under serious consideration for launch in 2021.

Mobility engineering education is ramping up on the western side of the state too. Western Michigan University's (WMU) Mechanical and Aerospace Engineering Department is now offering a recurring 3-credit course for both graduate and undergraduate students that covers the concepts required for engineering commercial automotive autonomous vehicles. This class goes above and beyond current online offerings because the students work through a series of labs where they collect and evaluate camera, radar, and lidar data using real sensors on a drive-by-wire 2019 Kia Niro. They gain experience writing algorithms that utilize deep learning, data processing, path planning, and controls. Students also design fully autonomous vehicles in simulation for evaluation using the physical vehicle as a capstone project. To date, the course has enrolled 55 students in a variety of majors including mechanical engineering, aerospace engineering, electrical engineering, and computer science. Future plans include adding an electric vehicles class, offering an official mobility engineering certificate program, and a continued focus on interdisciplinarity university-wide.

WMU envisions this investment to be a critical contribution to the state-wide mobility ecosystem, so that mobility research and development can expand beyond the southeastern side of the state. This education program has been made possible from state-funded mobility pilot programs from the Michigan Department of Transportation (MDOT) and the Michigan

Economic Development Corporation (MEDC), state-funded commercialization programs such as the Michigan Translational Research and Commercialization (MTRAC) Innovation Hub for Advanced Transportation, and federal funding from the U. S. Department of Energy (DOE).

MICHauto, under the umbrella of the Detroit Regional Chamber Foundation, is the statewide automotive and mobility cluster association focused on promoting, retaining, and growing Michigan's automotive and mobility ecosystem. In addition to driving initiatives related to advocacy and next generation mobility, MICHauto is taking action to ensure that Michigan is developing the underlying talent pipeline for the automobility sector in a strategic and holistic way that supports two primary goal sets: 1) attracting, growing, and retaining a diverse, inclusive workforce with equitable access, and 2) meeting the high-skill workforce demands for industry innovation, including startups and technology firms. Addressing the first goal, MICHauto's Discover Auto program went virtual this year to reach over 500 middle and high school students to showcase automotive and mobility careers and the exciting work that young professionals do to develop new high-tech products for vehicle integration. Launched as a grass roots social media campaign to promote the automotive and mobility industry as growing, global, high-tech, and inclusive, MICHauto expanded on Discover Auto with the You Drive the Future campaign aimed at educating and attracting students 13 – 20 years old on Instagram. The campaign includes career maps, advice, and day-in-the-life videos of OEM and supplier young professionals to highlight what the industry truly looks like today. To address the second goal of increasing the high-tech talent workforce, the group's High Tech Talent Initiative is a convening of industry, economic developers, and state agencies

to help identify and quantify challenges in the mobility labor pool and talent supply and propose solutions that will work for Michigan. Finally, MICHauto's Let's Detroit ambassador program works with companies to highlight and disseminate the word about how great it is to live in Michigan and work in its robust and innovative automotive-technology sector.

Smart Infrastructure/AV Tech/Cyber

Last year, Cavnue was selected by the Michigan Department of Transportation (MDOT) as the Master Developer to conduct a feasibility study for a first of its kind connected and autonomous vehicle (CAV) corridor between Detroit and Ann Arbor. This moonshot by the State of Michigan is intended to unlock the potential of autonomous driving systems, making roads safer, more reliable, more efficient, and providing benefits to road users, policy makers, OEMs, and road operators.

Over the last several months, considerable progress has been made by this public-private partnership. The Cavnue team met with over 400 stakeholders including elected officials, residents, advocates, and local project partners. Together they are developing initial perspectives on how this infrastructure could future-proof planned state investments in rebuilding Interstate 94 and Michigan Avenue and developing legislation to enable this innovative effort. Cavnue has invested over \$2 million into the project to this point, including establishing a Detroit office with eight people and counting.

This effort is being informed by local and global partnerships in the automotive and technology sectors. An OEM Advisory Committee with thirteen members, including Ford, General Motors, Toyota, and Waymo, meets regularly with Cavnue and the project team to provide insight and feedback on the technology that is being considered for the corridor.

It is clear that vehicles will continue to become smarter, and infrastructure, like the CAV corridor, can help accelerate the benefits to Michiganders.

OFME and MDOT will continue to work closely with Cavnue and all of the partners along the corridor to ensure that Michigan remains a global leader in mobility innovation.

GRIMM is a small, Veteran-owned cybersecurity research firm with expertise in cyber physical (CyPhy) systems security focused on advanced transportation mobility for both the public and private sectors. GRIMM's CyPhy team is located in the heart of transportation R&D with offices in Metro Detroit and a lab in Sparta, Michigan. The team includes policy and consulting professionals, along with skilled, Department of Defense (DoD) cleared hackers (researchers) approach cybersecurity through the lens of an adversarial attacker. The combined expertise working with hardware components, coupled with embedded systems and integrated software, ensures security flaws are identified and vulnerabilities of clients' products and systems to increase the cyber resilience, holistically. GRIMM advisors work with government entities to support the development of public policy specific to the inclusion of cybersecurity within the future mobility ecosystem while the firm's consultants support businesses seeking to integrate sound cybersecurity policy and practices into the R&D of their vehicle platforms and operating environments including: connected and automated vehicles, heavy trucks and military vehicles, public transportation, intelligent transportation systems, drones and aerospace, satellite communication, industrial control systems, and critical infrastructure. GRIMM has created or supported the development of automotive cybersecurity trainings with both GRIMM developed content and training tools such as car-hacking workbenches.

delivery vans and shuttles, heavy-duty regional trucking, and off-road equipment (forklifts, tarmac equipment, etc.). After approval in March 2021, the pilot website launched in May and all capabilities should be fully operational by year end.

Consumers Energy's PowerMIDrive pilot similarly offers EVSE rebates (see the CFME's February 2021 report for more details about these programs and services). To date the PowerMIDrive program has awarded over 750 home charger rebates, fully committing 200 public Level 2 rebates and expanding the pilot to 37 DCFC rebates via programmatic cost savings (up from the original 24 budgeted). Furthermore, over 320 EV customers requested rate changes and enrollment in the EV time-of-use (TOU) program, which has been an excellent achievement for customer cost savings even though an upgraded charger was not required to qualify for the pilot. (In the CFME's February report the PowerMIDrive had awarded 500 home charger rebates to date, fully committing 200 public Level 2 rebates, and had a total of 316 EV customers that had requested rate changes and enrollment in the EV TOU program.

The residential electric load profile data continues to show the TOU rate efficacy with 90% of charging occurring off-peak on weekdays (after 7:00 p.m.) and an increase to over 84% of charging across all categories (residential and public locations) off-peak. This data makes the case that electric vehicles can benefit all electric customers (not just EV drivers) while decreasing negative grid impacts that could result from EV clustering. Consumers Energy continues to also provide public EV engagement events, having now completed 65, and made nearly 6,000 direct communications to EV customers, helping educate the public about

electric vehicles and the financial supports and ancillary benefits of electrifying their vehicles. Consumers' EV customer base is now over 10,000 vehicles and continues grow by 20% annually, but is expected to accelerate even more as EV model availability, range and price points continue to improve.

In its rate case recently approved by the Michigan Public Service Commission (MPSC), Consumers launched its new PowerMIFleet pilot in June 2021 to build upon PowerMIDrive for non-residential customers. The new pilot has three features. First, is a continuation of the education and outreach effort that focuses on developing a consulting service for fleet vehicle electrification strategies, identifying the best EV substitute for the ICE vehicle's use, siting optimal charging locations based on the fleet's operations and providing a cost-benefit analysis for the total cost of ownership (TCO) calculation. Second is a continuation of the EVSE rebate pilot for electrifying fleets. Third is exploring cutting-edge vehicle-to-grid (V2G) testing, such as workplace demand response and bi-directional power flow demonstrations. If electric vehicles can be leveraged to help power office buildings during peak hours or be used as highly-mobile sources of stored energy in an emergency outage situation (i.e., to power a hospital or senior home), then the electrification of the transportation sector can be an even more paramount solution beyond the more immediate cost-savings to vehicle owners, positive environmental impact of emissions reduction and stability and growth of the automotive industry. Finally, Consumers Energy has committed to transitioning 100% of its light duty vehicle fleet purchases to EVs by 2030 and intends to incorporate heavy-duty models as they become available.

Status of MI's Government/ Public Mobility and Electrification Assets

The Office of Future Mobility and Electrification has been hard at work during its inaugural year as the state of Michigan's central hub and strategic planner for autonomous, connected, electric, and shared future mobility. Due to the dedication and effort of the office personnel OFME was able to deliver on some marquee projects and initiatives in spite of the office's limited resources.

Foremost is the recent announcement of the new, Detroit Smart Parking Lab. The smart parking lab is a new testing facility designed specifically for developing and deploying automated valet parking and electric vehicle charging technologies. It was created through partnership between the state, Ford Motor Co., Bedrock, Bosch, Enterprise Rent-A-Car, and the American Center for Mobility (ACM). ACM will manage and operate the facility and OFME will be offering technology activation grants to organizations of all sizes for on-site testing.

Earlier in the year, OFME led the development of a state fiscal year 2021-22 (FY'22) budget proposal for the future of mobility. The Mobility Futures Initiative (MFI) is a \$25 million investment to support a new collaboration to keep Michigan at the forefront of the rapidly evolving mobility sphere. The MFI is unique in that it is a single budget package that incorporates and coordinates three separate state departments under one vision, keeping government aligned on a shared target rather than inefficiently spending through siloed programs that were not designed to work together. If funded, the initiative will strategically buildout EV charging infrastructure, develop the automobility's future workforce and talent pool, deploy autonomous

vehicle technologies, and invest in local mobility solutions for Michiganders.

In April 2021, OFME, in partnership with MDOT, launched the Michigan Mobility Funding Platform (MMFP). MMFP was designed to provide grant dollars to companies looking to deploy their technology at a Michigan testing environment or in a real world deployment. Testing environment partners for the platform include Mcity, American Center for Mobility, GM Mobility Research Center at Kettering University, Michigan Unmanned Aerial Systems Consortium, Keweenaw Research Center at Michigan Tech, Great Lakes Research Center, and Advanced Power Systems Research Center. The MMFP is focused on catalyzing and scaling mobility solutions across three key areas of focus: sustainable futures, equitable futures, and multimodal transportation. The grant has a rolling deadline with three review periods within the 2021 calendar year.

Reaching the state's goal of developing, attracting and retaining one-third of the estimated 45,000 computer engineers that the national mobility sector will demand by 2030 is critical. OFME has worked with leaders of the state's talent and

workforce development initiatives to prioritize this industry's needs and strengthen the state's economy. Sixty by 30 is the state's strategic effort to increase Michigan's postsecondary educational attainment rate, led by the Sixty by 30 Office at the Department of Labor and Economic Opportunity. The goal is simple - By 2030, 60% of working-age Michiganders will have a certificate or college degree. Reaching the goal means that Michigan will be a talent leader — fueling the future workforce and providing opportunity for all.

Sixty by 30's key objectives align with the talent needs of the mobility and electrification industry, and the tools at the Sixty by 30 Office's disposal – when properly resourced – will help keep Michigan a global mobility leader.

Fuel economic growth: Michigan confronts a skills gap that threatens the state's economic growth. The jobs requiring skilled employees today, as well as the jobs on the horizon, demand greater education and training than ever before. Seventy percent of Michigan jobs will require at least some postsecondary education.

Even the playing field: Everyone in Michigan has a right to an educational path to success regardless of age, income, race/ethnicity or where they live. Today, however, significant attainment gaps exist by race/ethnicity, income and region. Michigan must close these gaps and create equal opportunity for all residents.

Lift incomes: Increasing attainment is good for Michigan and good for residents. The more educated we are as a state, the more prosperous Michigan becomes. The most thriving states in the nation also have the highest share of residents with a bachelor's degree or higher.

Futures for Frontliners is one of the helpful programs run by the Sixty by 30 Office. It is a last-dollar state scholarship program targeted to

appreciate and lift up Michigan's frontline workers who worked in essential industries during our state's COVID-19 shutdown in spring 2020. The scholarship provides eligible applicants with the opportunity to pursue an associate degree or skill certificate at any of Michigan's public community colleges and receive free in-district tuition, mandatory fees, and contact hours. Futures for Frontliners received over 121,000 applications during its three-month application period, of which over 85,000 qualified for the program. Over 15,500 qualified applicants have participated in the program so far by enrolling in the Winter/Spring 2021 semester; the first semester for which the award was available. Summer 2021 and Fall 2021 enrollments are currently on-going.

Michigan Reconnect is a last-dollar state scholarship program passed in 2020 to support the state's postsecondary attainment goal. The program aims to provide Michigan's adult learners, those who are 25 or older and do not have a college degree, with the opportunity to pursue an associate degree or skill certificate at any of Michigan's public community colleges and receive free in-district tuition, elimination of mandatory fees, and guidance supports. The scholarship has a rolling application and has received over 84,000 qualified applications so far. Summer 2021 is the first semester for which the award is available. Summer 2021 and Fall 2021 enrollments are currently on-going.

Eligible applicants who would prefer to attend a private training or use a private program provider could apply for the Michigan Reconnect Skills Scholarship, a one-time program that provides up to \$1,500 towards tuition costs for a skill certificate in one of five occupational areas: manufacturing, construction, business management, information technology or healthcare. The Skills Scholarship has received over 2,500 applications with nearly 500 applicants enrolled to date. Enrollments are currently on.

The Going PRO Talent Fund makes awards to employers to assist in training, developing and retaining current and newly hired employees. Training funded by the Talent Fund must be short-term and fill a demonstrated talent need experienced by the employer. Training must lead to a credential for a skill that is transferable and recognized by industry. In Fiscal Year 2021, the Going Pro Talent Fund awarded \$39,575,291 to a total of 1,021 employers. These grants helped to provide new skills to 11,751 new hires and upskilled 18,430 incumbent workers. The average cost per trainee was \$1,311.

Another state government asset supporting the mobility and electrification sector not mentioned in the CFME's February report is the Michigan Economic Development Corporation's (MEDC) Regional Talent Innovation Grant program. This program provided \$7.5 million in Community Development Block Grant-CARES Act funding to local economic development organizations and workforce development partners across the state through proposals for competitive training pilot programs in their regions. The grants are between \$500,000 and \$950,000 to eligible economic development organizations or other nonprofits, which will administer the training programs and target growth in specific occupations in high demand from regional employers. A priority will be training programs focused on low- to moderate-income individuals, particularly those living in geographically disadvantaged areas. It is expected that through these efforts, at least 750 individuals will receive training helping to address the lack of post-secondary credentials and a skills mismatch in occupations related to the MEDC's Strategic Focus industries, including mobility industry, industry 4.0, and advanced manufacturing.

Additionally, the MEDC is partnering with Ann Arbor SPARK to launch the Michigan STEM Forward internship program on a statewide level. SPARK has run the program on a local level through the Ann Arbor/Ypsilanti SmartZone with a decade of positive results. In scaling the program up, MEDC will work in partnership with SPARK to place 425-450 STEM students currently attending Michigan colleges annually into STEM-focused internships

throughout Michigan. With the support of a \$1.5 million grant, SPARK will contribute to 50 percent of the interns' pay, and participating companies will pay the remaining 50 percent. SPARK will track the employment status of the interns for at least 12 months to measure their retention in Michigan as well as those remaining in those knowledge positions. Of the students that participated in the regionally targeted internship program over the last five years, 84% of them accepted jobs in Michigan upon graduation.

This great work is on top of the MEDC's vigorous, multi-pronged effort to support and encourage adoption of Industry 4.0 technologies by Michigan's small- to medium-sized manufacturers. MEDC will be partnering with Automation Alley and Michigan Manufacturing Technology Center on goal of getting 6,200 businesses ready to adopt Industry 4.0 technologies by 2025. Up to \$2 million will be invested in a grant program to support regional Industry 4.0 readiness initiatives. The MEDC will also run a new campaign targeting manufacturing companies to generate awareness of Industry 4.0 opportunities and resources.

As Michigan continues the long-term transition toward a cleaner energy future, existing energy generation facilities may face reduced use and closures. The impact of this transition on Michigan's communities can create significant issues, such as reduced tax base, lost employment, significant reduction in services, site remediation needs, environmental justice challenges, and the need for economic development to overcome these challenges. To address these concerns, Gov. Gretchen Whitmer and the Michigan Department of Treasury created the Energy Transition Impact Project (ETIP). With community input, Treasury will provide analysis, assistance, expertise, and planning resources to assist in developing an energy transition strategy for areas affected. Treasury will partner with impacted communities to help them implement a comprehensive effort to maintain critical services when faced with the closure of energy facilities. Recognizing the need for a similar type of tool to assist with Michigan communities tied to internal combustion engine (ICE) manufacturing, OFME has engaged with

the ETIP to develop a tool to assist the state and its political subdivisions with the transition to the electrified transportation future.

The Michigan Infrastructure Council (MIC) at the state Treasury Department is charged with bringing together public and private infrastructure owners, regional representatives, finance and policy experts, and state departments to coordinate and measure infrastructure goals, safeguard investments, and develop an efficient, strategic, and statewide framework for integrated asset management. To that end, the MIC developed and released a project coordination portal, started an asset management training program, which provides training to managers of infrastructure assets across the state, and developed an assessment tool that allows local asset managers to conduct self-assessments against current asset management best practices. This integration of various infrastructure assets' management planning, a process called integrated asset management (IAM) is the precursor work to harmonizing the various infrastructure assets – their design, financing, installation, maintenance, and operations – in order to assure a seamless connected, autonomous, and electrified mobility future. The MIC is also tasked with the development of a 30-year strategy for infrastructure asset management in Michigan. Work on the 30-year strategy is planned to begin in Fiscal Year 2022.

The Department of Transportation is increasingly incorporating mobility technology into its traditional stewardship of roads and bridges and leadership in transit, rail and aeronautics programs. This incorporation is evident across the department, and is reflected in its future transportation plan setting the course for the years leading to 2045. MDOT staff, consultants, outside interests and the public have informed the contents of the report which is

now in the final stages of preparation. Its scope across different modes and emerging issues will make it a leading example among states.

In its road and bridge programs, MDOT continues to build out intelligent transportation system (ITS) technology at key points of traffic for safety and congestion mitigation. A special challenge in 2021 is responding to the FCC reallocation of wireless spectrum. MDOT is working with other state DOTs to obtain reimbursement for converting existing technology installations to reduced spectrum and to “future proof” the installations. Pursuant to the requirement in Public Act No. 140 of 2020, MDOT has commissioned a study of tolling on state roads with a comprehensive review of options, policies and considerations such as citizen privacy. The study is required to be completed by July 8, 2022. Within the field of vehicle electrification, MDOT is reviewing legal parameters and limits on charging stations within right of way under its jurisdiction, and is assessing such property for suitability of stations particularly where the private sector seems unlikely to locate a station. Among the leading priorities for MDOT is making the collaboration with Cavnue on the connected corridor between Detroit and Ann Arbor a successful example for the nation and world. Numerous potential benefits may arise from the collaboration including charging and wireless charging deployment, innovations in traffic management and optimal alignment with residents', government and business desires across varied local jurisdictions.

Leadership in other modes and programs is being demonstrated by initiatives such as aligning transit fare systems in southeast Michigan, issuing an RFP to study unmanned aerial system (UAS) use cases in a metropolitan area and an international RFP with colleagues in Canada studying cross-border mobility and technology issues. These activities and others suggest the upcoming year

will be busy with numerous productive studies and partnerships.

The Department of Environment, Great Lakes, and Energy is aggressively supporting EV adoption with a forecast that EVs will account for 50% of new vehicle purchases by 2030. This target will not be achieved without defeating both actual and perceived range anxiety. EGLE's Charge Up Michigan program continues to focus on building a robust EV charging infrastructure network Michigan. The program has exceeded the 68 EVSE projects listed in CFME's last report; the current count is over 80 EVSE commitments across the state. EGLE has also done excellent work through the Charge Up MI Communities and developed modeling for EVSE deployments for 10 of Michigan's biggest urban areas.

Working with the OFME, EGLE's Materials Management Division is beginning to develop end-of-and second-life use strategies for EV batteries and is looking at EV battery recyclable raw materials and component parts as a source for decreasing our native automakers' dependence on foreign suppliers and a means for establishing a circular economy.

The Michigan Public Service Commission (MPSC) is the state's regulator of utility service providers.

To date the MPSC continues to be amenable to the EV adoption and EVSE buildout programs in the utilities' rate cases. But the regulators help the state balance this surge in EVSE network development and new demand for energy on the grid with current load capacity limits, helping ensure the transition to electrified transportation is thoughtful, safe, reliable, and cost effective.

For example, since most EV charging will likely take place at customers' homes - as evidenced by the utilities' TOU programs showing nearly 90% of charging has taken place during off-peak hours - increasing EV penetration could eventually create grid issues; particularly if significant and rapid adoption of EV charging is concentrated in particular communities or on specific circuits. While EV adoption is not expected to drive a need for major investments over the next five years, it will become an increasing distribution planning consideration, and it is the MPSC's role to address these potential challenges as more EVs are driven by Michigan businesses, institutions and homeowners.

MPSC ensures that utility companies' energy distribution plans increasingly account for EVs over the long term and that they are identifying neighborhood EV clusters in advance to identify



potential capacity constraints and maintain reliability. Likewise, the MPSC helps the state's mobility and electrification ecosystem by ensuring active measures are implemented to control or influence the timing of when customers charge their EVs.

Significant electrification of fleet vehicles could have a major impacts on the overall electric load profiles for electric utilities. Due to the likelihood of their charging at central locations and their larger battery capacity, electric vehicle fleets will have larger load demand profiles than residentially owned EV. Consequently, the impact of increased fleet electrification to utility distribution planning will be different than the impacts of non-fleet cars and light trucks. The MPSC is here to help ensure the utility companies plan for increased load on the grid in a timely, efficient manner, at the lowest possible cost to customers.

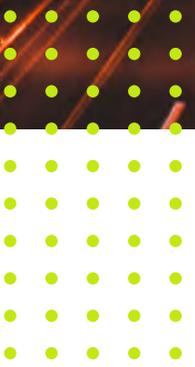
The Michigan Public Service Commission is also working with the OFME to develop potential use cases for vehicle-to-grid (V2G) and vehicle-to-building (V2B) technologies as well as projects that integrate EV charging stations with distributed battery storage or renewable energy systems. These technologies will help increase the utility of electric vehicles, provide cost savings or even revenue sources for EV owners, and support greater energy grid efficiency, resiliency, and security.

The Michigan State Police continuously looks for new and innovative ways to increase not only trooper safety, but secure motoring of the public, as well. In 2019, 44 fully marked MSP patrol vehicles with emergency lights activated were struck by motorists. MSP believes that providing the public an advanced warning of troopers' presence along a roadway, or during a response to an emergency, can enhance the safety of everybody in that area

by providing extra time to slow down, move over, or prepare to stop. Emergency vehicle digital alerts provide such warnings to vehicle and device based mobile applications enabled to receive them. In 2020, MSP deployed piloting emergency vehicle digital alert units in a small number of patrol vehicles in varied geographic areas across the State of Michigan. Over 89,000 motorists received these alerts from our MSP units in 2020. The State Police are currently exploring expanded capabilities related to the same technology that would provide for digital alerts to be sent and received between responder units, further enhancing our enforcement members' safety.

In 2020, MSP ordered and has deployed 65 hybrid Ford Utility police interceptor units and have more on the way.

The CyberAuto Challenge is a groundbreaking event in automotive cybersecurity held each year in Michigan. The Challenge is a five-day practicum-based workshop in which teams comprised equally of students and professionals, including automotive engineers, government engineers, and ethical "white-hat" hackers, work on real cars to find real answers to the challenges posed by cybersecurity in automobiles. Teams work to identify automotive cybersecurity trends and develop talent in a new technical discipline in a high-tech industry. The Michigan State Police (MSP) has been attending the CyberAuto Challenge with technical and enforcement personnel since 2016 and has been attending the sister event, CyberTruck Challenge, since 2018. Members of the MSP have worked closely with the CyberAuto staff and students over the past several years in the focus areas of vehicle forensics and vehicle health (cyber resistant) issues. In 2021, the MSP has taken a more active role to highlight the topic of vehicle forensics in the cyber domain.



Public Policy Review

Comparative Analysis Update

Since the first CFME report earlier this year, there has been legislative activity on automated vehicles, but much more emphasis on vehicle electrification and related issues. The following update relies on information compiled at the National Conference of State Legislatures (NCSL) web site under the state legislation database.

Automated Vehicles: 12 states have enacted 15 public acts regarding automated vehicles in 2021. These states include Arizona, Arkansas, Florida, Georgia, Maryland, Nevada, New Jersey, New Mexico, Texas, Virginia, Washington and West Virginia. Public acts in New Jersey, Virginia and West Virginia appropriate funding for research or business development programs which include automated vehicles. Of the remaining public acts, providing specific statutory standards for delivery devices appears to be a frequent theme, appearing in acts in Arizona, Florida, Georgia and Nevada. Acts in Arizona, Arkansas, New Mexico and Washington provide authorization for public road testing and numerous provisions for reporting to policy makers.

Cybersecurity for automated vehicles: No state appears to have enacted cybersecurity laws

specifically for automated vehicles since at least 2017. Arizona's legislature considered two bills on the subject in 2021, but neither has become law.

Energy/Electrification: In contrast to cybersecurity, states have been active in this legislation. 41 states have enacted 163 laws within these categories: climate change/emission reduction, energy efficiency/building codes and standards, transportation and transportation/alt.fuels. Several more bills are pending in many legislatures. The public acts address fees paid for electric vehicles and incorporating charging infrastructure into broader utility regulation. Combined with the prominence in the pending federal reauthorization, electrification legislation seems a compelling topic for future council deliberations.

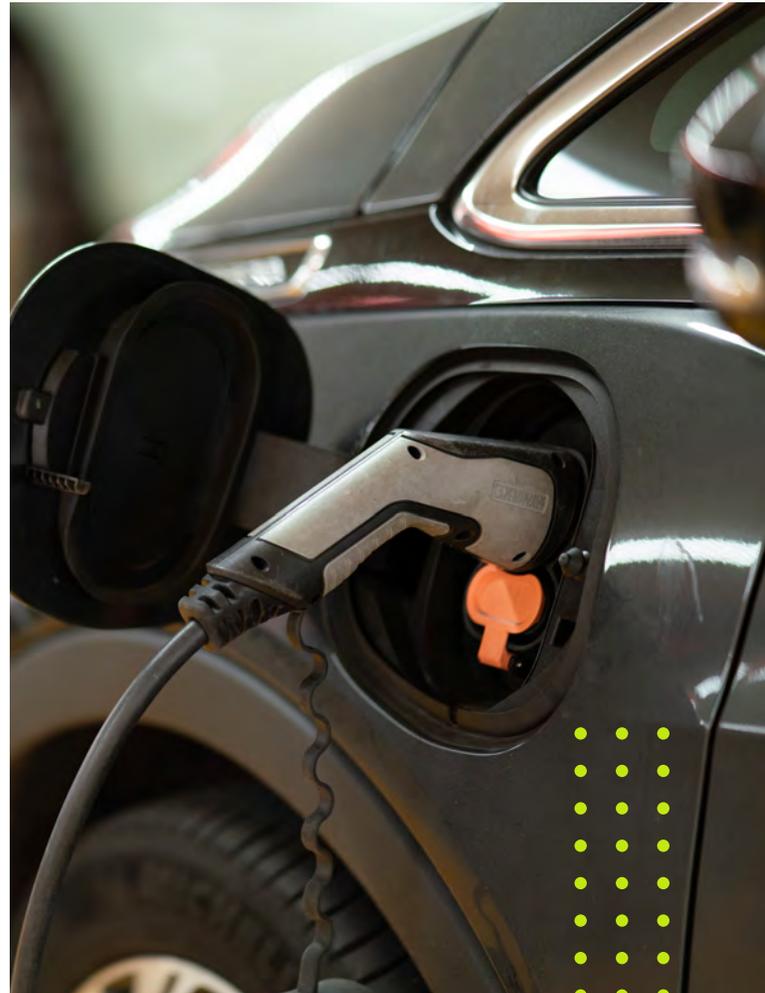
Appendix 1

CFME Process Overview

To tackle the daunting task of determining achievable policy recommendations which would further Michigan’s mobility and electrification leadership and fit the aforementioned themes, the Council on Future Mobility and Electrification divided into four workgroups. Each workgroup was assigned a neutral, outside Senior Advisor with particular expertise to guide the policy process. The workgroups were made up of Council members, as well as relevant outside stakeholders.

Each workgroup took a similar approach to the policy development process. It began by surveying members on what they believed were the most pressing issues when it came to their workgroup topic. Workgroup members then decided together which issues were of greatest near-term and long-term value, were solvable through public policy, and had feasible solutions. Policy solutions which had alignment with Michigan’s mobility strategy being developed by OFME as well as alignment with federal funding opportunities were given priority. The final ranking determined the policy recommendations ultimately pursued by the workgroups.

After the top issues were identified for each workgroup, members and outside subject matter experts were brought in to discuss each issue in deeper detail. Through those discussions, policy ideas were shaped into recommendations that could solve address the gaps in the ecosystem and that were plausible to implement. Policy briefs were created for each recommendation and presented to the wider Council during their July meeting for approval to include into the report. Those briefs were then turned into the narrative for this report.



ELECTRIFICATION

Senior Advisor: John Peracchio, former chair of the Council on Future Mobility and Managing Member of Peracchio & Company

Council Members

Tremaine Phillips, MPSC
Liesl Clark, EGLE
Cory Connolly, EIBC
Bob Babik, GM
Chris Nevers, Rivian
Dr. Satish Udpa, MSU
Sen. Mallory McMorrow, Senate Minority

Outside Stakeholders Representing

Utilities and Energy Sector
Environmental and Ecology Organizations
EV Charger Manufacturers and Operators
Energy and EV Technology Developers and Testing Facilities
Battery Recyclers
Economic Development Organizations
Public and Private EV Charger Site Hosts
EV Manufacturers and Supply Chain
Local Governments

INSURANCE, REGULATIONS & PUBLIC SAFETY

Senior Advisor: Alisyn Malek,

Executive Director at the Commission on the Future of Mobility

Council Members

Anita Fox, DIFS
Rick Arnold, MSP
Tremaine Phillips, MPSC
Emily Frascaroli, Ford
Patrick Cadariu, Waymo
Rep. Ranjeev Puri, House Minority

Outside Stakeholders Representing

Cybersecurity Firms
Insurance Interests
Utilities and Energy Sector
Transit Agencies
Disability Advocates
AV Manufacturers and Tech Developers
Postsecondary Institutions
Local Governments

ECONOMIC & WORKFORCE DEVELOPMENT

Senior Advisor: Carla Bailo, President and CEO at the Center for Automotive Research

Council Members

Susan Corbin, LEO
Jeffrey Guilfoyle, TREAS
Jeff Dokho, UAW
Dr. Satish Udpa, MSU
Emily Frascaroli, Ford
Steve Bartoli, Stellantis
Rep. Jim Lilly, House Majority

Outside Stakeholders Representing

Utilities and Energy Sector
Technology Developers and Testing Facilities
Startup Incubators
Talent Development Experts
Economic Development Organizations
EV Manufacturers and Supply Chain

AV TECHNOLOGIES & SMART INFRASTRUCTURE

Senior Advisor: Reuben Sarkar, President and CEO at the American Center for Mobility

Council Members

Rachel Eubanks, TREAS
Jeffrey Guilfoyle, TREAS
Tony Kratofil, MDOT
Robert Babik, GM
Patrick Cadariu, Waymo
Derek Caveney, Toyota
Dr. Huei Peng, UofM
Sen. Ken Horn, Senate Majority

Outside Stakeholders Representing

AV Manufacturers and Tech Developers
Smart Infrastructure Developers and Operators
EV Manufacturers and Supply Chain
Transit Agencies
Aerial Mobility Developers



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