



**Council on
Future Mobility
& Electrification**

2020 REPORT



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Message from the Chairwoman



Susan R. Corbin

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Acting Director, Michigan
Department of Labor &
Economic Opportunity

Chairwoman, Michigan
Council on Future
Mobility & Electrification

Since the first Model T rolled off an assembly line, Michigan has been the global leader in the mobility sector. Maintaining this leadership is imperative to the continued prosperity of Michigan and its citizens.

Recognizing the importance of the future of mobility, Governor Whitmer signed Executive Order 2020-2 creating the Council on Future Mobility & Electrification (CFME) to develop public policy recommendations that will maintain Michigan’s leadership in advanced mobility and electrification.

I am proud to serve as the Chair of the CFME as it introduces its first Annual Report. The goal of this report is to assess the state’s ability to successfully navigate the key trends that are defining the future of mobility: autonomous driving, vehicle connectivity, powertrain electrification, shared mobility, intelligent automation, and global supply chain.

This report includes an assessment of Michigan’s mobility resources and assets, including the state’s auto manufacturing sector, citizen talent pool, university network, testing facilities, infrastructure and multimodal transportation systems, insurance and regulatory systems, and the impact of our public policies. This report also provides an analysis of the future challenges that Michigan must begin to address to remain a global mobility leader.

The publication of this report comes at a critical time for the mobility sector and the state. By 2030, hybrid or electrified vehicles will represent 51% of all vehicle sales, 50% of vehicle production will have Level 2 autonomy or higher, and software will represent more than 50% of the value of a new vehicle. Beyond technology, the mobility industry demand for computer-related engineers will eclipse 45,000 nationally by 2030, and the demand for new jobs in the utility sector deploying charging infrastructure will reach 105,000. Additionally, the automated vehicle market will grow over \$3.3 trillion in value.

As the industry evolves, it will create many good-paying jobs and build a more environmentally friendly transportation sector, including more equitable pathways to economic prosperity for all Michiganders.

This report's key finding is that to fully take advantage of the opportunity ahead of us, Michigan must work collaboratively with partners to address several challenges. Michigan must enhance its high-skilled talent development and attraction efforts in this industry and address workforce transition and development. Strategies must be developed to increase the state's share of advanced auto manufacturing and the accompanying supply base. Michigan must tackle the issues responsible for low electric vehicle adoption rates. Finally, Michigan must activate greater capital investment in automated vehicle technology and focus more on startup and second-stage business development.

Michigan's historic strength in the automobile industry gives our state an enormous lead in the global competition to develop and deploy these new technologies. Under Governor Gretchen Whitmer's leadership the state has already started tackling many of these issues head on. Through our Sixty by 30 initiative, Michigan is working to build the skilled workforce necessary to grow and attract more jobs that require in-demand skills. In the year ahead, the Office of Future Mobility and Electrification and our Council will use this report as a baseline to develop policy recommendations that ensure Michigan retains its global leadership position in mobility.

EXECUTIVE SUMMARY

- Revolutionary changes like electrification and automation are poised to transform the mobility sector, and there is a global competition to determine where advanced vehicle technologies will be built.
- Michigan's mobility assets include the nation's largest concentration of private sector facilities, a robust network of universities, state and federal offices; collaborative efforts between the private sector, academia, and state agencies such as the Michigan Department of Transportation, Michigan Department of Environment, Great Lakes and Energy, Michigan Department of Labor and Economic Opportunity, and the Michigan Economic Development Corporation, which are at the forefront of mobility trends.
- Our state continues to produce and attract the nation's largest concentration of engineering talent, though more skilled workers will be needed to help the industry continue to grow.
- Large investments in electrification and automation give Michigan an edge in these critical technologies, but there is room to grow when it comes to private sector investment and mobility startups in the state.
- Our state has experienced an increase in manufacturing jobs over the last decade. This demonstrates that Michigan continues to be the global leader in the mobility sector. With the right investments, our state is well positioned to continue to attract and retain the jobs of the future.

Introduction

The Michigan Council on Future Mobility and Electrification (CFME) was established by executive order of Governor Gretchen Whitmer on February 25, 2020. Simultaneously, the new Michigan Office on Future Mobility and Electrification (OFME) and position of Chief Mobility Officer were created within state government. Together these moves were heralded worldwide as Michigan's reaffirmation of its rich automotive roots, endorsement of aligning electrification efforts with the rest of future transportation and a revolutionary step in governmental approach to the no-longer pending Mobility Revolution.

As we move into this new era of transportation, like our friends in the auto-manufacturing industry, Michigan has retooled itself to be better equipped for growing the mobility industry, adapting for electric and automated vehicle proliferation and making transportation safer, more equitable and environmentally sustainable in order to strengthen our state's economy.

Mobility has been and always will be an innovative factor for both transportation and infrastructure. But it likewise has initiated a transformational shift in the energy and telecommunications sectors, talent and workforce demands, economic development opportunities and the makeup of economies at large. The placement of the CFME within the Department of Labor and Economic Opportunity (LEO) - in partnership with the state Departments of Transportation (MDOT) and of Environment, Great Lakes and Energy (EGLE) - was a strategic choice. The intention is to better align mobility initiatives with the state departments responsible for talent attraction and growth, workforce issues, economic development, public transportation, infrastructure growth and environmental issues. A chance to reimagine Michigan, diversify our economy,

increase the durability of our labor pool and families, improve quality of life and future-proof our infrastructure, the Mobility Revolution is Michigan's greatest social and economic opportunity in decades.

To get it right, we must be strategic, we must be smart, we must be determined and we must work together – across industries, across politics and with strong partnership between government, private enterprise, academia and others. The CFME is uniquely constructed to ensure a balanced blend of perspectives are lent to its process. The council has representation from seven state departments, 10 seats for private-sector organizations and technology leaders, non-state government, academia and research and four seats for a bi-cameral, bi-partisan delegation of the state legislature. The council has also initiated four working groups, led by Senior Advisors with industry expertise, to help with the development of its policy recommendations. They are centered around the topics of electrification; insurance, regulatory systems and public safety; economic and workforce development; and automated vehicle technologies and smart infrastructure.

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. Abdul Hammoud, House Minority

Senior Advisors

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

To help Michigan capitalize on this generational social and economic opportunity, the CFME is charged with developing recommendations for public policy that will ensure Michigan continues its global leadership in future mobility and electrification. This includes autonomous and connected vehicle technologies, electric powertrain technology and charging infrastructure and diverse mobility solutions such as shared transportation and transit. This list or report of policy recommendations must be developed at least annually; the first due date being 12 months of the enacting executive order being signed.

This document is the first such report of the Michigan Council on Future Mobility and Electrification. Readers should, however, understand one important caveat about this particular report. As previously noted, Governor Whitmer signed EO 2020-02 on February 25, 2020. Less than a month prior, on January 31, 2020, the United States Department of Health and Human Services declared a public health emergency for the novel coronavirus (COVID-19). After carefully monitoring the virus's spread, on February 28, 2020 the governor activated the State Emergency Operations Center. By March 10, 2020 the Michigan Department of Health and Human Services identified Michigan's first COVID-19 cases and Michiganders braced for impact. Subsequent executive orders put a freeze on state government hiring to preserve precious taxpayer resources and appointments to the CFME were delayed until October 22, 2020.

Since being appointed, the CFME has worked diligently to schedule its meetings, organize its structure and begin the work to develop tangible, actionable policy recommendations for the state of Michigan. Our intention is to publish another report well before another 12 months expire that contains the product of that work. This document contains a survey of Michigan's mobility industry advantages and supportive public assets and policies that help define our global mobility leadership in 2021.

Status of Michigan's Industry & Non-State Mobility Assets

When answering the question, “Why is Michigan still a global leader in the future of mobility?” it is prudent to start by pointing to the powerful presence of the automotive industry, the concentration of advanced mobility talent and the extensive research and development investments made here.

Michigan is home to 24 light-duty original equipment manufacturers (OEM) headquarters or technology centers. Combined, the manufacturing sector contributes over \$225 billion to the state's economy annually. Twenty-one vehicle models and 1.8 million vehicles in total were assembled in Michigan in 2019. Seventeen percent of all 2019 vehicle production and 11% of all North American vehicle production occurred in Michigan. There has been \$41.5 billion in OEM and supplier investment in Michigan over the last decade. Ninety-six of the top 100 automotive suppliers to North America have a presence in Michigan and 60 are headquartered here.¹

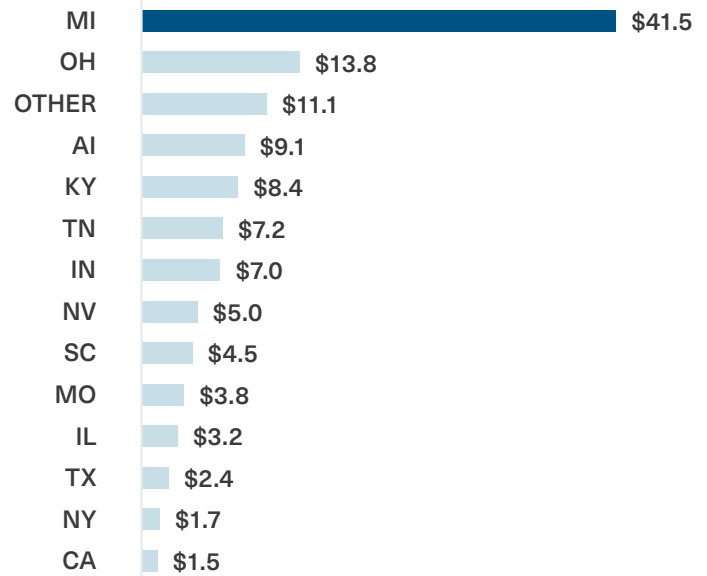
While auto production has been ramping up in other states and cities around the world, Michigan is still the beating heart of the vehicle manufacturing industry and Detroit is still very much the Motor City.



¹ [2020 Michigan is Automobility Report - MICHauto](#)

Automotive manufacturing jobs have grown in Michigan by 10% from 2015 to 2019.

Since the Great Recession, automotive manufacturing jobs in Michigan have grown by 49.2%, adding approximately 60,867 jobs. In 2017 alone, automotive manufacturing jobs in Michigan rose by 1.1% or approximately 1,300 jobs. From 2009 to 2019, Wayne (#1) Macomb (#8) and Oakland County (#17) led the nation in new manufacturing jobs.



Annually, Michigan hosts \$14 billion in business funded automotive research and development. This represents 72% of the nation's share. Michigan also ranks number one for operational U.S. Department of Transportation funded and connected vehicle deployments with 11 projects. Fifty-eight percent of Michigan automotive suppliers conduct automated vehicle testing in the state. Michigan has consistently ranked top ten (6th in 2019) in the nation for number of inventors, with nearly 10,000 issued patents in 2019.²

Globally, Michigan companies exported \$59.8 billion in goods with \$29.2 billion allocated to transportation equipment in 2017. That amount stood tall in 2018 with another \$58 billion. These numbers mark a 77% increase since the Great Recession and the revival of the automotive industry. This makes Michigan the top exporter of transportation equipment in the United States and

the sixth largest exporter among states generally. Among the top ten exporting states in the U.S., Michigan is just one of two to post positive five-year export growth. Ten and one-half percent of U.S. transportation equipment manufacturing exports come from Michigan companies. Combined, Detroit's traditional automakers – Stellantis (formerly Fiat-Chrysler Automobiles), Ford Motor Company and General Motors operate 81 international assembly plants (Stellantis 24, Ford 26, GM 31). With these stat lines, Michigan is a major global supplier of advanced mobility parts and their related technologies in the U.S.

However, the forecasted disruption and challenges on the horizon for this industry and thereby Michigan's economy, tell a different story.³ There has not been a fundamental transformation in the automotive industry in decades and the Mobility Revolution involves not just one but

² [2020 Michigan is Automobility Report - MICHauto](#)
³ [Mobility 2030: Transforming the mobility landscape](#)

multiple changes, including an overhaul of the traditional automaker business model due to the anticipated shift towards mobility-as-a-service (MaaS) and shared transportation, stretching of vehicle development cycles, as well as new market entrants.⁴

The integration of automated technologies means that software – not hardware – will become a much more valuable component of future vehicles. The market for software development is expected to grow by roughly 10% annually, reaching \$5.3 billion in 2030.⁵ Automotive electronic and software components will grow in importance, accounting for estimated totals of \$156 billion and \$50 billion of annual auto sales, respectively.⁶ These components will be the leading force behind the anticipated rising compound annual growth rate of auto sales generally for the next ten years.⁷ Michigan must continue to improve its high-skilled talent pipeline if we are to capture that high-tech portion of the industry and its growing share of the industry's future profit pools.

The emerging EV revolution creates a risk that critical supply chains may develop outside the United States. The global battery arms race started years ago and the U.S. is behind. Chinese companies manufacture 83% of the anodes and 61% of the cathodes that go into batteries and China controls more than 70% of the global electric vehicle battery manufacturing capacity.⁸ The United States controls less than 10%.⁹ Moreover, electric vehicle powertrains are mechanically simpler than internal combustion engines (ICE) and require different components. This could

result in labor displacement in both manufacturing and aftermarket maintenance. Battery electric vehicles will replace ICE vehicles and the shift to their production will change the economies of scale in the auto-makers' supply chain. Not only will demand for ICE vehicle components trial off over the next 20-30 years now that major OEMs are announcing plans to manufacture only EVs, but EVs require fewer parts to make. Additionally, the traditional design-test-build cycle for auto manufacturing will grow longer as EVs stay on the road for longer lifetimes than ICE vehicles have. On the other hand, the workforce pool is not large enough for what is needed to deploy EVSE (electric vehicle supply equipment) networks and retrofit housing stock with charging infrastructure. Furthermore, EV manufacturing, EV suppliers and EV repair facilities will be in demand for labor as the sector grows. In short, maintaining Michigan's global leadership in the future of mobility and electrification requires us to address these workforce trends and capture more of the future automotive supply chain. We must be more than committed – Michigan must be at the vanguard of efforts to attract and develop a greater market share of manufacturers and supply base and create more jobs while also doubling down on workforce programs to assist with any necessary realignment of labor to adjacent skillsets and employment opportunities. Ignoring these trends could risk significant, negative implications for Michigan's economy. Likewise, without a near-term and significant shift in national prioritization of developing the domestic EV supply chain, American automakers could be dependent on foreign suppliers for years to come.

⁴ [Auto 2030 Report: Jan. 2006, McKinsey](#)

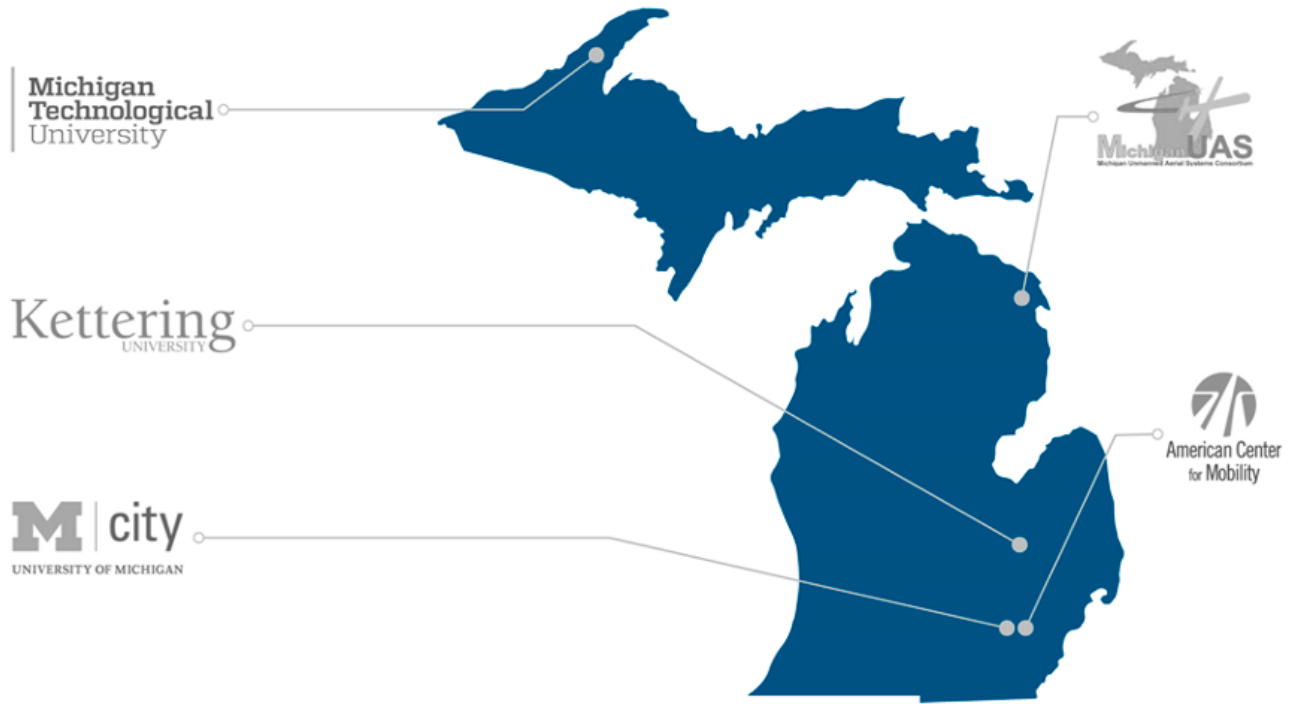
⁵ [From no mobility to future mobility: Where COVID-19 has accelerated change, McKinsey](#)

⁶ [From no mobility to future mobility: Where COVID-19 has accelerated change, McKinsey](#)

⁷ [From no mobility to future mobility: Where COVID-19 has accelerated change, McKinsey](#)

⁸ [The Commanding Heights Of Global Transportation - SAFE \(secureenergy.org\)](#)

⁹ Ibid.



When looking through a more focused advanced mobility lens, though, Michigan is still a world leader. The state has deployed over 115 Roadside Units (RSU) for connected vehicle communications, enabling over 500 miles of roadway equipped for vehicle testing - making Michigan home to the largest deployment of Vehicle-to-Infrastructure (V2I) technology in the U.S. We also have the second largest system of adaptive traffic signals in the nation. Michigan also has more than 120 pending Intelligent Transportation Systems (ITS) public safety license applications with the FCC.

There are over 2,200 facilities with engineering, design, testing and validation capabilities. Michigan also is home to nine proving grounds and five unique testing sites: the American Center for Mobility (ACM) in Ypsilanti, Mcity in Ann Arbor, Michigan Technical University in

Houghton, Michigan UAS in Alpena and the Kettering University / General Motors Mobility Research Center in Flint. We also completed the first connected and automated vehicle (CAV) international border crossing with U.S. Army / TARDEC and MDOT Truck Platooning Test.

One great testament to Michigan's mobility leadership is the state's eagerness to participate in the co-development of the industry and technological innovations alongside and in strong partnership with private enterprises. Our very own Council on Future of Mobility and Electrification is a good example, as are our distinguished test sites: Michigan maintains the world's most diverse collection of advanced mobility testing environments for both early- and commercialization-stage technologies.

The American Center for Mobility is a collaborative effort between government, industry and academic organizations. ACM is focused on accelerating the mobility industry through research, testing, standards development and educational workforce programming. The facility is a global smart mobility test center with miles of real road systems integrated with ITS, providing a safe platform for the testing of emerging vehicle and mobility technologies. ACM is an innovation technology campus at which mobility companies can co-locate and offers environments and event space for showcasing vehicle technologies and convening industry activities. ACM boasts 500-acres of real-world environments is capable of testing a multitude of scenarios and has over \$200 million invested in infrastructure, facilities and equipment. This includes a 700ft. curved tunnel, a 2.5 mile high-speed loop and ACM's own dedicated cellular network. There are over 500 companies using ACM facilities as their home base. Perhaps an outlier in a year that was plagued by the COVID-19 pandemic, ACM saw further growth in 2020 and is well positioned to further evolve infrastructure technology toolsets available to support simulation and closed-track validation in connected, automated, electrification and cybersecurity product deployments. ACM also offers companies marketing and branding, demonstration and product showcase support. This facilitates new investment opportunities, connection and networking opportunities and industry exposure.

Mcity is a 32-acre artificial urban/suburban testing environment at the University of Michigan. The facility has an augmented reality lab that can simulate real-life traffic scenarios and an onsite autonomous shuttle (NAVYA). Mcity has attracted 60 industry partners and has done over \$20 million in research projects.

Michigan Technical University (MTU), located in Michigan's Upper Peninsula, offers users cold weather testing with over 900-acres of ice and snow off-road routes. MTU also has partnered with the state of Michigan to pilot deployments of marine autonomous applications. Michigan UAS is a commercial drone testing facility boasting 11,000 square-miles of airspace. Michigan is fortunate to be one of the few places technology developers for aerial transportation can test long-range / medium-altitude flights. The Kettering University / GM Mobility Research Center offers a 3.25-acre customizable test pad and a low-speed performance course as well as a research annex.

As highly automated vehicle and electrification technologies become more developed, safe and standardized, our test facilities continue to attract strong leadership that reinvigorate and reimagine these facilities. They will need to continue adapting and address the potential challenges that exist as proving grounds for technologies intended for commercial deployment. Keeping Michigan at the forefront of transportation innovation remains a motivating factor for the state's support of test facilities.

Our talent pipeline needs to evolve and expand if we are to remain global mobility leaders.

Forecasts for the automotive industry indicate national demand in the sector for computer related engineers will eclipse 45,000 by 2030. Michigan will need to graduate or attract a third of that number to retain our global pole position in mobility. Currently, Michigan enjoys a lead in mobility



and electrification talent. Nineteen universities and colleges in Michigan offer nationally ranked undergraduate engineering programs and four offer nationally ranked graduate programs. Over 121,468 total degrees were awarded by Michigan educational institutions in 2017. 8,000 of those were engineering degrees, of which 41% were master's degrees or higher. In 2018, these numbers climbed with more than 8,600 engineering degrees being awarded with 39% being master's degrees or higher and 138,585 degrees awarded in total.

The University of Michigan offers 19 Top-10 engineering programs. Michigan State University offers globally-recognized supply chain programs. Looking holistically at the region, there are 13 Top-100 U.S. universities and another 15 in Ontario all within a five-hour drive of Detroit. Michigan's higher education institutions attract \$2.5 billion in research and development investments, \$424 million of which is dedicated to engineering. This places Michigan 8th in the U.S. for higher education research and development performance.

It is not just high-skilled talent with advanced degrees either. Michigan's mobility and electrification future also depends on growing the pipeline for general labor and skilled trades.

As advanced mobility technologies create job opportunities for the wider public we will need more community college graduates, greater capacity at trade and technology schools and more robust apprenticeship programs.

Potential and future workers will need to understand what jobs are available and how they can access the appropriate training to secure those jobs. Mechanisms for engagement between industry and students and jobseekers on a more consistent bases will help identify needs and opportunities. This can happen through career explorations and awareness events (e.g. MI Career Quest), mentorships and internships. Industry-hosted community events at which residents can better understand the jobs that are available in their community are one such mechanism. The industry will also benefit by supporting and growing Career and Technical Education (CTE) programs in Michigan. Not only are those skills directly applicable to the future of mobility, but data shows that students who participate in CTE programs are more likely to enroll in post-secondary education. There should also be robust industry involvement in Science, Technology, Engineering, Art and Mathematics (STEAM) programs from elementary through high school. In particular, as we strive to ensure equity within the Mobility Revolution, these changes should seek to cast a wider net to underrepresented populations, including women, minorities, veterans, individuals with disabilities and returning citizens.



Cybersecurity technologies and workforce are critical to the advanced mobility and electrification space as connected vehicles and shared transportation trends take off. Some industry analysts predict more than three-quarters of cars will be connected in some way as early as 2025. Autonomous, electrified ride-sharing are expected to become the biggest profit pool in the sector with estimates totaling \$90 billion in 2035. Furthermore, cybersecurity technologies in the automotive sector will grow from \$5 billion to nearly \$10 billion over by 2030, with cybersecurity software experiencing a 10% compounding growth rate over that same time.¹⁶ Michigan is developing its

technological readiness for this change in order to deliver on the promise that advanced mobility will increase public safety in the transportation sector. The U.S. Department of Energy recently awarded a Michigan-based cybersecurity company in conjunction with the American Center for Mobility \$7 million to develop infrastructure that protects the electric grid from cyber-attacks on electric vehicles and charging stations. Michigan is ninth in the U.S. for cybersecurity growth potential with 8,760 job openings in this sector. We will require more cybersecurity talent and fill all those positions that will be created in the coming years if we want to continue global mobility leadership.

¹⁶ [From no mobility to future mobility: Where COVID-19 has accelerated change, McKinsey](#)

As it seemingly has with all things, the COVID-19 pandemic has had an impact on mobility and electrification related talent goals. Early predictions indicate that there has been a 40% decline in mobility hires during 2020 in Michigan. This is not a mobility industry-specific problem, however and numbers should rebound once vaccine proliferation is reached and we begin to put the public health crisis behind us. We have already started to see jobs coming back online, especially as companies have created and engaged new safety methods for limited person-to-person interaction. This proves yet again the ingenuity of the mobility sector.

Though growing in both size and prowess, Michigan's private investment environment is not as robust as some other states. Recent reporting ranked Michigan just twenty-fourth amongst states for its entrepreneurial environment.¹⁷ For context, startups in top-five ranked California received \$77.3 billion in venture capital funding across 2,869 companies, for an average of \$26.9 million per company. In Florida the average was \$8.2 million per company and in Texas it was \$6.8 million.¹⁸

In Michigan, there are 23 venture capital (VC) firms and 8 angel investors funding mobility technology startups, while another 71 provided entrepreneurial support.¹⁹ Nine percent of the startups that received funding from VC firms in Michigan in 2018 were focused on mobility solutions, translating to 11% of all VC investments in the state being dedicated to the mobility sector (\$385 million).²⁰ In 2019, there was a total of \$771 million in VC investments made in Michigan, a 53% increase from 2015.²¹ Five percent of all angel investments in Michigan focus on mobility startups.²² We are now proudly home to four unicorn companies (a startup valued over \$1 billion) – Duo, Rivian, OneStream and StockX – and one of just 10 states with more than one such company. Clearly, mobility startups and early-stage companies have reasons to see Michigan as a supportive option for their initial and long-term success, a boost to the private investment ecosystem in our state would only increase our ability to retain global mobility leadership.

¹⁷ [Best States to Start a Business \(2020 Study\)](#)

¹⁸ [Best States to Start a Business \(2020 Study\)](#)

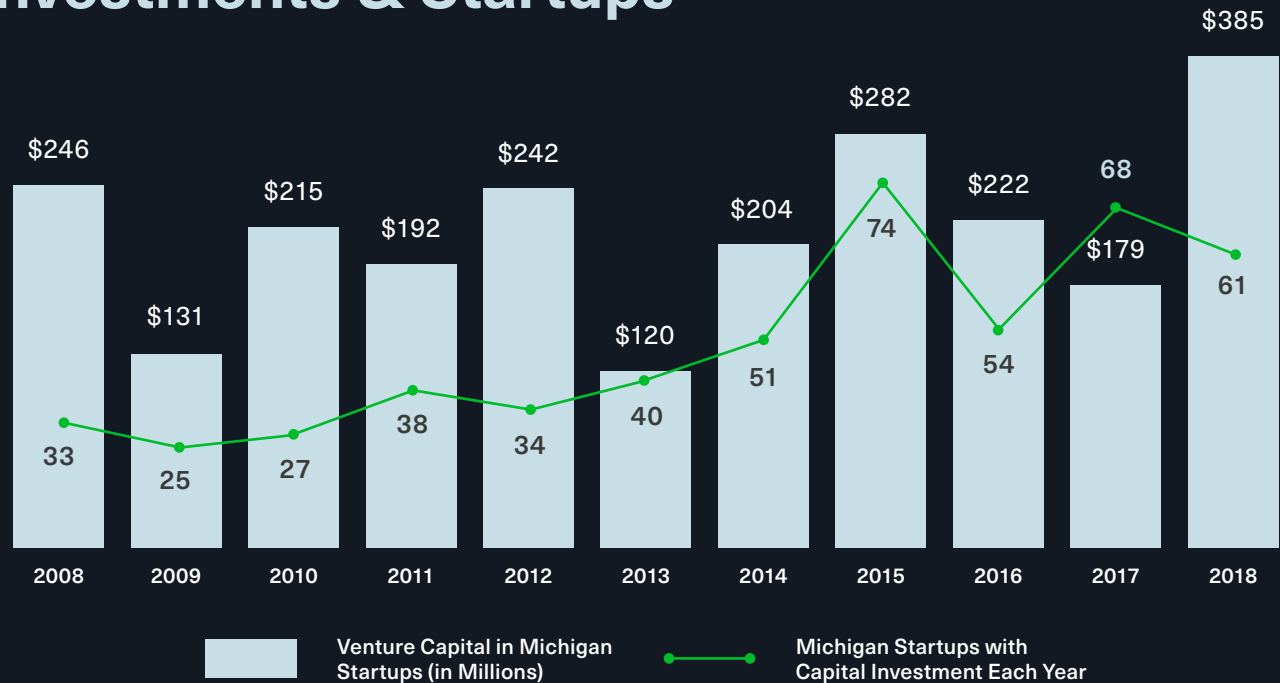
¹⁹ [From no mobility to future mobility: Where COVID-19 has accelerated change, McKinsey](#)

²⁰ [2020 MVCA Research Report](#)

²¹ [From no mobility to future mobility: Where COVID-19 has accelerated change, McKinsey](#)

²² [From no mobility to future mobility: Where COVID-19 has accelerated change, McKinsey](#)

Annual Venture Capital: Investments & Startups



Overall, investments in Michigan’s mobility and electrification sectors are strong. Among the top funded undertakings in Michigan in 2019, we should highlight:

GENERAL MOTORS’ \$2.2B

for Factory ZERO, retooling the Detroit-Hamtramck Assembly Center to build both the upcoming GMC Hummer-EV and the fully autonomous Cruise Origin vehicles at scale.²³

STELLANTIS’ \$4.5B

in-state investment across five existing facilities creating nearly 6,500 jobs and producing the new Durango mHEV and next-generation, electric Jeep and Ram lineups.²⁴

FORD’S \$700M

for retooling Dearborn’s historic Rouge Complex and adding 300 jobs to build the electric F-150 pickup.²⁵

AKASOL’S \$40M

for a battery technology integration center.²⁶

WAYMO’S \$13.6M

automated vehicle technology integration facility.²⁷

²³ [Factory ZERO Becomes First U.S. Auto Plant to Install 5G Technology](#)

²⁴ [Fiat Chrysler gets another \\$92.8M for Mack Avenue plant project](#)

²⁵ [Ford Breaks Ground on New Electric F-150 Plant at Historic Rouge Center](#)

²⁶ [German EV battery maker Akasol to build first North American plant in metro Detroit](#)

























²⁷ [Detroit plant now producing self-driving vehicles with Waymo](#)

CELL & BATTERY PACK PLANTS, 2020

Recent, large investments related to electrification and autonomy signal that Michigan has an important opportunity to lead in developing domestic battery and tech supply chains - one we cannot afford to miss. Thus far, Michigan is home to LG Chem's battery cell production (Holland), Clarios battery cell production and development (Holland), Samsung's SDI batter cell production

(Auburn Hills), A123 Systems battery development (Novi) and Akasol battery technology center (Hazel Park). But there is a long way to go before capacity and production meets anticipated need and the longer we wait to develop the next generation supply chain the more the risk grows that American automakers and Michigan jobs could become dependent on foreign suppliers.



 Type of battery operation: Cell Holland, Mich. (1)	 Type of battery operation: Cell Lordstown, Ohio (6)	 Type of battery operation: Cell Jackson County, Ga. (12)	 Type of battery operation: Packs Vernon, Calif. (17)
 Type of battery operation: Cell Holland, Mich. (1)	 Type of battery operation: Cell Endicott, N.Y. (7)	 Type of battery operation: Packs Spartanburg, S.C. (13)	 Type of battery operation: Cell TBD
 Type of battery operation: Battery dev. Novi, Mich. (2)	 Type of battery operation: Cell Clarksville, Tenn. (8)	 Type of battery operation: Packs Joplin, Missouri (14)	 Type of battery operation: Packs Rawsonville, Mich. (19)
 Type of battery operation: Cell Auburn Hills, Mich. (3)	 Type of battery operation: Battery prod. Smyrna, Tenn. (9)	 Type of battery operation: Cell Sparks, Nev. (15)	 Type of battery operation: Cell and Packs Midland, Mich. (20)
 Type of battery operation: Cell Hazel Park, Mich. (4)	 Type of battery operation: Battery prod. Chattanooga, Tenn. (10)	 Type of battery operation: Battery prod. Fremont, Calif. (16)	 Type of battery operation: Battery prod. Normal, Ill. (21)
 Type of battery operation: Packs Buffalo, N.Y. (5)	 Type of battery operation: Battery prod. Tuscaloosa, Ala. (11)	 Type of battery operation: Battery prod. Hayward, Calif. (16)	 Type of battery operation: Packs Ridgeville, S.C. (22)

While still in the early stages, Michigan has made strides in building out our electric vehicle charging network.

The state currently has 480 publicly accessible charging stations with nearly 1,400 charging outlets, with another 146 charging stations at private businesses in Michigan. This has helped to address range anxiety concerns that initially turned off potential, new EV consumers and has facilitated some growth in EV adoption numbers, putting Michigan squarely within the top 25% of states for electric vehicle registrations in 2018 with plenty of room to grow. To contextualize these numbers, however, the 4,210 registered EVs we had in 2018 were far fewer than California's 256,800 that same year.

The vehicle purchasing rebates and charging network buildout programs operated by the state's utilities and approved by forward-thinking state regulators have also assisting with EV adoption and created job opportunities as they drive demand for skilled labor, like electricians, to install and maintain more chargers, transformers, switchgear and perform line upgrades.

Consumers Energy's PowerMIDrive program offers rebates to residential and commercial customers. Residential customers are eligible for up to \$500, while commercial customers installing publicly accessible electric vehicle supply equipment (EVSE) may receive up to \$5,000 per Level 2 EVSE, up to \$70,000 per direct current fast-chargers (DCFC) and customer credit for make-ready expenses such as transformer and line upgrades. The PowerMIDrive program has been quite successful, awarding 500 home charger rebates to date, fully committing 200 public Level 2 rebates

and expanding the program to 36 DCFC rebates via programmatic cost savings. Furthermore, a total of 316 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 program. The residential electric load profile data has shown the TOU rate efficacy with 90% of charging occurring off-peak on weekdays (after 7:00 p.m.) and over 75% occurring off-peak on weekends. This helps make the case that electric vehicles can benefit all electric customers (not just EV drivers) while lowering the risk of negative grid impacts that could result from EV clustering. Also, as a part of the program, Consumers has done over 30 public EV engagement events and made nearly 4,500 direct communications to EV customers, helping educate the public about electric vehicles and the financial supports and ancillary benefits of electrifying their vehicles. The overall usage and popularity of the program has Consumers pursuing new residential options and rebates. Consumers' EV customer base is now over 7,000 vehicles and has more than a 20% annual growth rate. In its rate case recently approved by the Michigan Public Service Commission (MPSC), Consumers is launching its new PowerMIFleet program to build upon PowerMIDrive. The new program 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 program for electrifying fleets. Third is 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, environmental impact of emissions reduction and securing the future of the automotive industry. Finally, Consumers Energy has committed itself 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.

Similarly, DTE Energy sees accelerating the EV market as a way of helping all customers optimize energy use, reduce greenhouse gas emissions and better manage energy rates. The company designed two programs to educate customers and provide rebates and assistance for charging infrastructure. The Charging Forward – Phase 1 emphasizes light-duty vehicles. The Charging Forward – Fleets program emphasizes medium- and heavy-duty vehicles (pending regulatory approval). Additionally, DTE's fleet team has a focus on both mature and emerging technologies and provides consultancy services by connecting customers to vehicle manufacturers and products that optimize energy use, decrease operating costs and reduce harmful vehicle emissions. DTE also offers turnkey solutions by developing partnerships to help customers secure available funding to subsidize the adoption of EVs and guide end-users through the EV infrastructure design and build process.

The Charging Forward – Phase 1

The program's objectives are three-fold. First is to help customers realize the benefits of EVs and reduce barriers to adoption. Second is to integrate

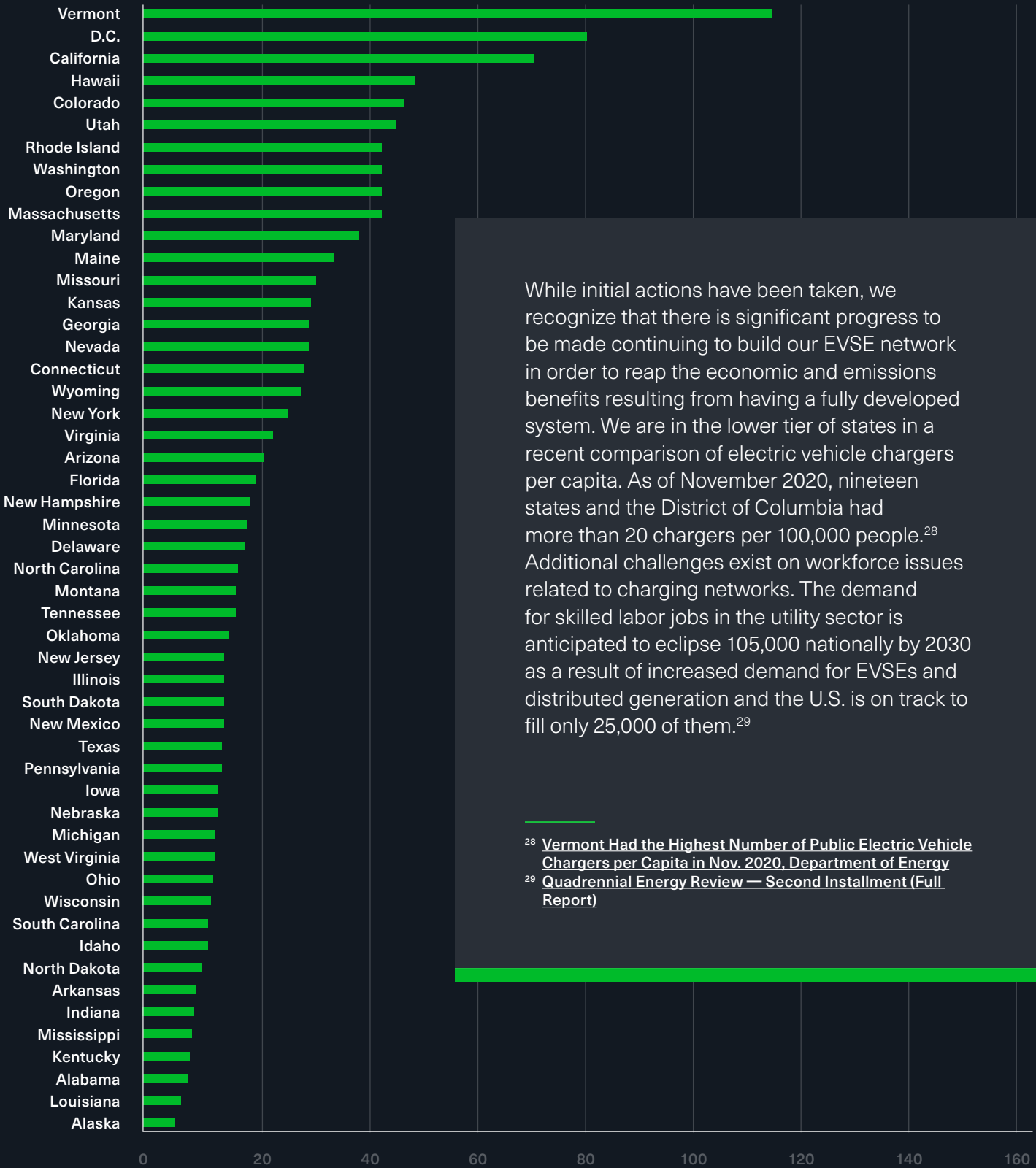
EV load efficiently with the distribution system by actively managing charging times and ensuring that the net benefit of EV load accrues to all customers. Third is to improve the company's understanding of EV load characteristics and its impact on the distribution system to prepare for widespread EV adoption in the future. The initial proposal approved by the MPSC was for \$13 million and has since expanded by another \$1 million. The program provides up to \$500 in rebates for the installation of 2,600 Level 2 EVSE at personal residences if the PEV owner enrolls in the company's time-of-use charging incentive program. It also provides up to \$55,000 in rebates for deployment of 90 DC fast-EVSEs and rebates of \$2,500 per port for deployment of 1,000 Level 2 EVSEs by commercial customers. The program also includes efforts to inform and recruit potential site hosts and features to enable equitable access to EVs as well as funding for a unique V2G pilot and impact study. As of the closing of books in 2020, DTE's Charging Forward program has made over 19 million educational impressions and approved rebates for 343 residential chargers, 369 Level 2 chargers and 72 DCFCs with commercial users.

The Charging Forward – Phase 2

The program is planned to continue with this good work and expand into five new segments: mass transit, electric school buses, light- and medium-duty delivery vans and shuttles, heavy-duty regional trucking and off-road equipment (forklifts, tarmac equipment, etc.).

The Indiana-Michigan Power company also offers special time-of-use (TOU) charging rate incentives. Municipally-owned utilities are also future-proofing themselves and facilitating EV adoption in their service territories. The Holland Board of Public Works, for example, offers residential customers a \$300 rebate for the purchase of a Level 2 EVSE.

EV CHARGES PER 100,000 PEOPLE BY STATE, NOV. 2020



While initial actions have been taken, we recognize that there is significant progress to be made continuing to build our EVSE network in order to reap the economic and emissions benefits resulting from having a fully developed system. We are in the lower tier of states in a recent comparison of electric vehicle chargers per capita. As of November 2020, nineteen states and the District of Columbia had more than 20 chargers per 100,000 people.²⁸ Additional challenges exist on workforce issues related to charging networks. The demand for skilled labor jobs in the utility sector is anticipated to eclipse 105,000 nationally by 2030 as a result of increased demand for EVSEs and distributed generation and the U.S. is on track to fill only 25,000 of them.²⁹

²⁸ [Vermont Had the Highest Number of Public Electric Vehicle Chargers per Capita in Nov. 2020, Department of Energy](#)
²⁹ [Quadrennial Energy Review — Second Installment \(Full Report\)](#)



As we look to the future of mobility and electrification here in Michigan, we do so with the encouragement of knowing how prevalent and active the industry already is in our state. But that does not mean we can rest now. Being proactive in our goal to shape the next generation of electrification and mobility has the potential to deliver immense economic and quality of life values. Alternatively, choosing the path of reticence and reactivity may pose a significant risk to our economy. Our informed forecasting sets 2030 as a year of demarcation for mobility and electrification and for Michigan. By then, hybrid or electrified vehicles will represent 51% of all vehicle sales, 50% of vehicle production will be L2 or higher (level 2 autonomy, meaning partially autonomous operations) and software will represent more than 50% of the value in a new vehicle. Beyond technology, the mobility industry demand for computer-related engineers will eclipse 45,000 nationally, the demand for new jobs in the utility sector deploying charging infrastructure will be 105,000 and the automated vehicle market will grow over \$3.3 trillion in value. In other words, by 2030 the scales tip. The Mobility Revolution is inevitable now and for all intents and purposes it has already come. We are excited for it and are prepared to embrace the opportunities it brings.

The Mobility Revolution is no longer on the horizon. It is here and will continue to grow more prevalent over the next decade.

Status of Michigan's State Mobility Assets

Today, the auto industry and the transportation sector at large are undergoing a period of unprecedented change. The universe of mobility options is expanding and how those options are designed, produced, owned and used is transforming, especially in the following ways:

Industry Impact: The last 10 years have shown a strong domestic auto industry. However, Michigan's per capita income remains below the national average. A strong domestic auto industry no longer guarantees widely shared prosperity in Michigan. The last decade has also seen four foundational technologies (self-driving technology, vehicle electrification, shared mobility and vehicle-to-road connectivity) begin to disrupt Michigan's traditional auto industry. This disruption is shifting profit pools and creating new winners and losers along the supply chain. It has also put a more intense focus on innovation and attracting entrepreneurs to the state.

Climate Impact: The last ten years have also seen global carbon emissions from transportation exceed carbon emissions from built infrastructure. This has heightened the importance of transitioning from internal combustion engine vehicles to electric vehicles and expanding Michigan's electric vehicle charging infrastructure. Mobility and electrification solutions will be needed to combat climate change. Additionally, electric vehicle leadership can build a stronger, more resilient Michigan economy.

Infrastructure Impact: The most important benefit of new mobility technologies is safety. Nearly 10,000 fatal car crashes have occurred in Michigan

over the last decade. Ninety-four percent of them attributed to human error. Deploying smarter infrastructure-based technologies along with highly automated vehicles could reduce accidents up to 90%. Additionally, smart infrastructure can be a cutting-edge economic development tool that drives business growth, equitable transportation and community vitality.

Workforce Impact: The jobs impact of mobility and electrification will be significant. Nationally, the mobility industry will need 45,000 new people with computer-related engineering skills by 2030. Michigan will need 12,000 people with these skills to retain its pole position as the global mobility leader. Reskilling and upskilling Michigan's manufacturing talent, beyond trained engineering graduates, will also be critical. A jobs disruption can occur with electrification impacts on vehicle supply chain demands and automation in the assembly process. However, the state's pursuit for overall growth in Michigan's share of the manufacturing industry combined with the unbridled growth in demand for workers charging up from the infrastructure side of mobility and electrification (e.g. autonomous transfer hubs, EVSEs), will spur abundant opportunities for skilled labor that we must be prepared for.

Michigan's position as a global leader in mobility and electrification will also be impacted by the level of cross-departmental collaboration within state government. Specifically, this involves the state departments in charge of industry and workforce, climate, the grid, infrastructure and passenger transit.

It was against this more collaborative backdrop that Governor Whitmer created the Office of Future Mobility and Electrification (OFME) inside LEO with MEDC staff and support. As mentioned before, the Michigan Office on Future Mobility and Electrification (OFME) and position of Chief Mobility Officer were created within state government at the same time as the Council on Future Mobility and Electrification (CFME). While state employees in Michigan have been thinking about and working on the future of mobility for many years, the establishment of OFME marked a different approach. Previously, advanced driving systems and electrification issues were tangential workstreams covered by state offices and agencies with other primary objectives. We now have an entire team of state of Michigan personnel dedicated to work on mobility and electrification issues, develop a common state strategy and coordinate it with the rest of state government and with partners in the private sector. The OFME represents a fundamental shift in how the state government in Michigan views the Mobility Revolution.

OFME is here to help shape the future of the industry in order to generate a positive impact on our society and economy, while helping the state to adapt proactively to pending disruption presented by industry shifts.

The Office of Future Mobility and Electrification does not act alone. The Michigan Department

of Transportation (MDOT) is a national leader on Intelligent Transportation Systems (ITS) and one of the state's greatest mobility assets.³⁰ MDOT's ITS Program mission is to provide high quality, adaptive and integrated transportation technology solutions that improve safety and mobility for all users. Currently, MDOT maintains and operates nearly 6,000 ITS devices statewide, including Closed Circuit Television (CCTV) cameras, vehicle detectors, Dynamic Message Signs (DMS), Environmental Sensor Station (ESS) sites and Connected Vehicle (CV) road side units. The MDOT ITS Program is also responsible for:

- Operating and staffing four Transportation Operations Centers (TOC) and supporting the Advanced Traffic Management System central control software used to manage the ITS field devices including the US-23 Active Traffic Management or Flex Route systems.
- The Freeway Courtesy Patrol program that aids motorists and first responders on freeways.
- The statewide maintenance of all ITS devices and networking communications.
- Statewide Real-time Video Sharing program and MiDrive Traveler Information Website support.
- Traffic Probe Data and Reporting Analysis tools that provide travel times to motorists and traffic data analysis to support Statewide reports such as the Statewide Congestion and Mobility Report to MDOT staff.
- Connected and Autonomous Vehicle (CAV) program operations and maintenance.
- The MichiVan program which is a regional ride-sharing service.

³⁰ [Why Michigan Mobility? Michigan Business](#)

MDOT has also continued to partner with the purpose-built test facilities in Michigan to encourage transportation innovation and identify infrastructure attributes that would support the safe and efficient operations of Connected and Automated Vehicles (CAV) and other mobility technologies. Most recently, MDOT has partnered with the American Center for Mobility on a U.S. Department of Energy-sponsored project to develop and refine technologies for fuel-efficient platooning in mixed traffic highway environments. MDOT has also worked with the University of Michigan's Transportation Research Institute (UMTRI) and Mcity to establish consistent implementations of connected intersections to ensure interoperability is achieved in the Ann Arbor Connected Vehicle Test Environment, with the goal of fully interoperable deployments across Michigan and eventually nationwide. MDOT has also worked with a number of research entities on cutting-edge transportation infrastructure research including, Michigan State University, Michigan Tech University and Kettering University. These continued relationships with Michigan test facilities and researchers allow MDOT to evaluate infrastructure technologies in a closed course setting to determine feasibility before real-world implementation and continue to have great value to the department.

Michigan also has a long history of supporting public transit, with some form of service offered in all 83 counties in the state. Public transit is an important factor in the new mobility ecosystem, providing millions of residents access to jobs, education and medical services each year. Technology and innovation are transforming public transit and therefore improving the lives of our citizens. MDOT, in coordination with OFME/PlanetM, launched the \$8 million Michigan Mobility

Challenge in 2018. The purpose of the challenge was to utilize technology and innovation to solve mobility gaps for senior citizens, persons with disabilities and veterans across our state. Thirteen projects, submitted by public/private partners, were funded and are in various stages of deployment. Projects included the design and demonstration of a fully-accessible electric autonomous shuttle, development and deployment of an automated robot and trailer that could be used for delivering groceries and medication to the homebound, innovative services tailored to the wellness needs of veterans, mobile applications to enable online booking and coordination of regional transit, apps to assist people with visual and cognitive challenges to ride public transit with confidence and then navigate their way through large medical facilities and the demonstration of an automated wheelchair securement system that improves the independence and dignity of those using personal mobility devices. Many other innovative projects are being planned for future deployments around the state including a statewide MaaS platform to improve access to information and multi-modal coordination, electric transit buses and infrastructure and full-size electric autonomous transit buses. Additionally, MDOT is showing national leadership by serving on national CAV and mobility workgroups, the Electric Bus Coalition and several committees under the larger efforts of ITSA, AASHTO and TRB.

Improved testing of shared mobility infrastructure and concepts, including the integration of rapidly growing micro-mobility, continues across Michigan. As vaccine shots go in arms, the post-COVID-19 outlook for shared micro-mobility improves as analysts predict a robust return to shared transit consumer trends and a decrease in procurement and permitting costs for the industry. The potential

result is a five percentage point increase in profitability.³¹ As micro-mobility providers enter the state, municipalities continue to refine the state's approach to shared and multi-modal transportation and explore complete street designs that encompass bikes, scooters, pedestrians and all forms of non-motorized transit. For example, the current pilot in Grand Rapids for shared micro-mobility will run through 2021 to assess the fit of micro-mobility business models for Michigan and its citizens. Enhancing our understanding of consumer preference shifts as shared mobility becomes mainstream will help Michigan adapt to

In 2020, Michigan announced one of the most ambitious mobility initiatives in history: building the world's most sophisticated roadway.

changing values and residents' demands.

With MDOT at the helm, the state sought innovative proposals to define a systems solution approach to develop and implement a connected and automated vehicle corridor (CAV-C), operating in support of a larger cooperative automated transportation (CAT) landscape. MDOT selected Cavnue, LLC as the Master Developer that will work with MDOT to envision, design, evaluate, iterate, test and implement the CAV-C. Implementation of this concept is intended to advance the state of play in application of connected and automated vehicle technologies to real-world personal mobility needs at scale and to serve as a practical model for future implementation on other corridors as part

of an integrated transportation system. The CAV-C envisions all stakeholders and elements of the transportation system working together to improve safety, mobility, equity and operational efficiency through interdependent vehicle, infrastructure and systems automation enabled by connectivity and information exchange. MDOT will work with Cavnue to establish the CAV-C supporting the following core principles of; personal mobility, OEM neutrality, open data sharing and effective system operations. This innovative, first-of-its-kind project will allow MDOT and Cavnue to define CAT system components supporting CAVs including; infrastructure investments, data exchanges and security and policy and/or regulatory actions. This project is significant as it has the potential to guide the further implementation of CAV Corridors not only throughout Michigan, but the county and world.

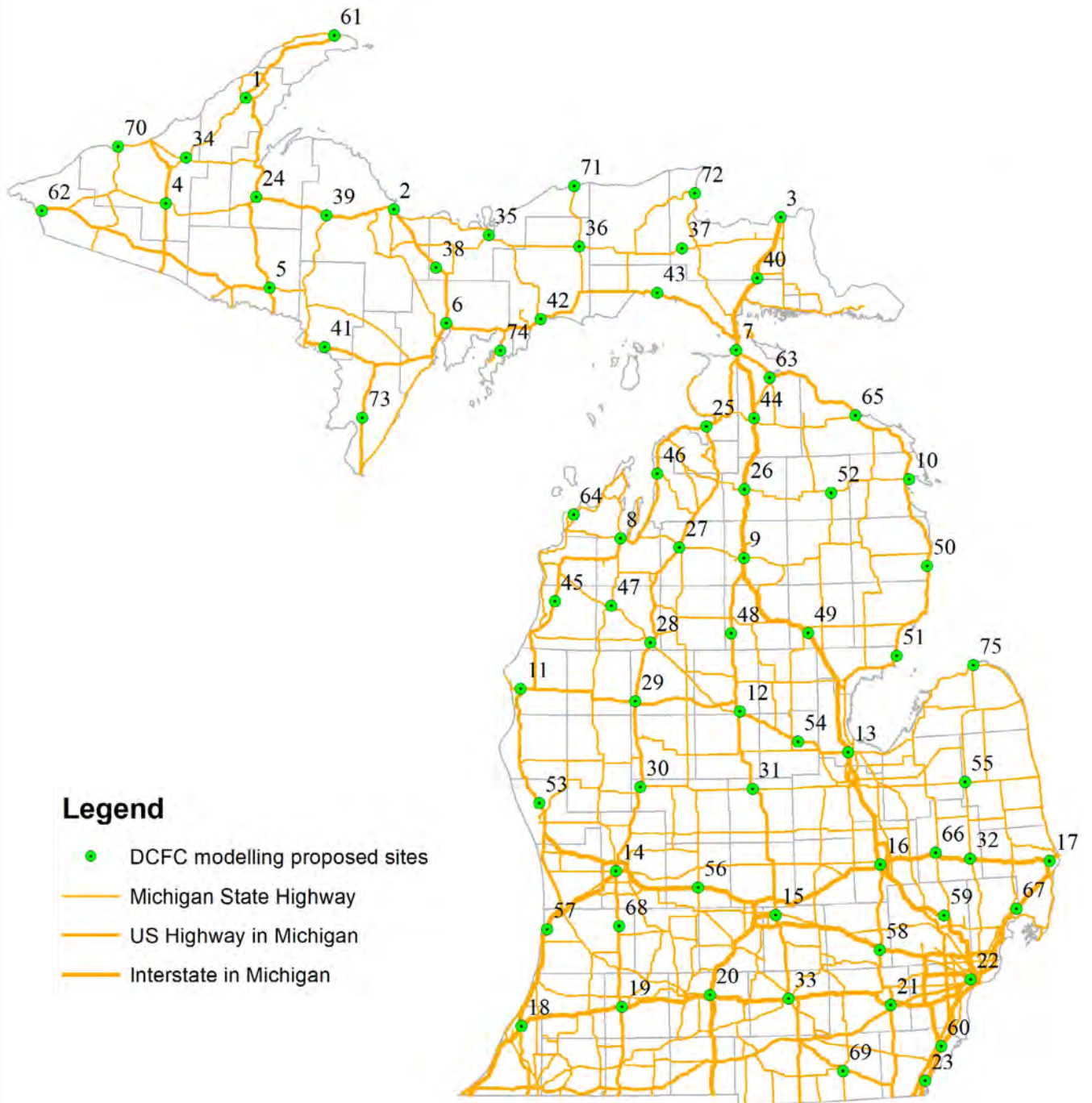
³¹ [From no mobility to future mobility: Where COVID-19 has accelerated change, McKinsey](#)

In 2019, Governor Whitmer joined Michigan to the U.S. Climate Alliance, a coalition of governors working to reduce greenhouse gas emissions in line with the global climate goals of the Paris Agreement. The governor followed this up by announcing in 2020 a new state initiative around climate, a new Climate Council and setting a target for Michigan to achieve carbon neutrality by 2050. Electrifying the transportation sector is mission critical for this initiative. The state department of Environment, Great Lakes and Energy (EGLE) has led the state's electric vehicle charging infrastructure effort. EGLE operates a multi-stakeholder initiative to model the placement of DCFC stations and other infrastructure needed along Michigan highways and select residential areas to support light-duty electric vehicle travel across the state. EGLE has also partnered with Michigan State University to develop a charging site optimization map, allowing the state and the public to know precisely where additional EV chargers are needed in order to build out a more robust charging network and reduce range anxiety.³² To date, EGLE has contributed just under \$3.4 million, leveraging an additional \$8.6 million of private investment, to fund 68 EVSE projects. Amazingly, the state's share of the total program costs has only been 28.2%.

EGLE is in the process of securing commitments to build out 75 DCFC stations with nearly 300 chargers across Michigan by 2030.

EGLE has also issued \$12.9 million for the replacement of diesel school buses, helping improve pupil transportation and make Michigan's education system healthier and more environmentally-conscious while saving school districts money on total cost of fleet ownership.

³² [Charge Up Michigan, EGLE](#)



There are other features of Michigan's state government that also lend themselves to our mobility ecosystem. Chief among those include, the Michigan State Police (MSP) cyber programs and the Department of Technology, Management and Budget's (DTMB) Cybersecurity and Infrastructure Protection agency.³³ The state's Cyber Civilian Corps (MIC3) is a team of trained, civilian cybersecurity professionals who assist in responding to critical cyber attacks against state government, schools, businesses and other organizations in Michigan. The state also is home to the world's largest, unclassified cyber range and through partnership with the Merit Network, Michigan is establishing itself as a national leader in cybersecurity training and workforce development.³⁴

The state of Michigan is also keenly focused on talent and workforce development as well as economic development and business attraction. States with a large pool of skilled workers will attract more job creation. Growing our state's educational attainment rate is critical in order to grow auto and mobility jobs. The Department of Labor and Economic Opportunity (LEO) houses key agencies and initiatives in these arenas. LEO is raising awareness of educational attainment for its residents via the statewide Sixty by 30 initiative. The Sixty by 30 office is working to strengthen our state economy by increasing the number of Michiganders with a postsecondary credential from 45% to 60% by 2030.³⁵ Additionally, LEO programs such as Going Pro Talent Fund, Futures for Frontliners and Reconnect are ensuring Michigan's workforce is more educated. This will mean more people prepared to compete in a modern workforce and solve tomorrow's problems. LEO's Workforce Development Agency (WDA) convenes industry employers and educational institutions to ensure there is a pipeline of

³³ [SOM - Cybersecurity, DTMB - Organization Contacts](#)

³⁴ [Hubs - Merit](#)

³⁵ [Sixtyby30.org](#)





workers that possess the necessary skills.³⁶ As employers identify critical skills WDA works to ensure there are enough educational programs producing the talent that meet employer needs. LEO also aggressively supports work-based learning programs, such as apprenticeships and significantly invests in in-demand training through the Going Pro Talent Fund. The majority of awards are supporting the manufacturing industry. LEO is also leading the effort to support more lifelong learning for Michiganders. Also within LEO is the Office of Global Michigan's Michigan International Talent Solutions program that empowers highly educated immigrants and refugees to return to their professional fields.³⁷

The Michigan Economic Development Corporation (MEDC) is the state's principal business development and attraction actor, helping establish vibrant communities and keeping us on a path of long-term economic growth.³⁸ In 2016, the PlanetM brand was created out of MEDC as a campaign to market the state of Michigan as the birthplace of automotive and the future of mobility. After a year of marketing success, PlanetM evolved into a business development tool for mobility in Michigan – focused on growing the ecosystem through technology activations, company connections and asset visibility. Since its inception in 2017, the PlanetM program has facilitated over \$94 million in investments and revenue, 93 technology activations, 5,604 qualified introductions, 2,340 economic development leads and 190 attraction/expansion opportunities. As of 2021, the PlanetM brand has been sunset by MEDC and its mission and team are part of OFME.

³⁶ [LEO - Workforce Development](#)

³⁷ [LEO - Office of Global Michigan](#)

³⁸ [MichiganBusiness.org](#)

Among the governmental mobility and electrification assets here in Michigan are our public policies supporting highly automated vehicles and advanced driving systems. In 2016, Michigan passed a slate of the most progressive advanced mobility laws in the country. Since then, those laws have been replicated by several states. Today, public policies across the several states covering advanced driving systems span the following issues:

- 1 Allowing testing of autonomous vehicle (AV) technologies.
- 2 Allowing AV operations on public roads.
- 3 Allowing AV operations without a human in the vehicle.
- 4 Allowing AV vehicle platooning.
- 5 Allowing on-demand AV operations
- 6 Enabling liability protections for AV users.
- 7 Having a state entity advising on advanced mobility issues.
- 8 Requiring an official report to policymakers regarding the intersections of the mobility sector and public policy.
- 9 Specifically allowing automated delivery devices, separately from a more overarching AV law.
- 10 Local government regulations and fees on advanced driving systems, or identifying the state as the sole oversight authority.
- 11 Allowing AV testing, but only through an official, arduous permitting process.
- 12 Allowing AV testing, but only in limited geographic areas or application case.
- 13 Requiring specifically and separately from an otherwise overarching and controlling state law, the reporting of automobile crashes involving AV technologies and that individuals and vehicles remain at the scene.
- 14 Requiring data sharing by AV companies.

Michigan is the only state to have implemented items 1-8 on this list. Alabama has all except #5, #9, #11 and #12. Florida has all except #7, #11, #12 and #14. Nevada has all except #7, #8, #9, #13 and #14. Utah has all except #7, #11, #12 and #14.³⁹ It would be too subjective of us to say that any one set of these laws is preferable to any other or is best, given that only each state itself is capable

of making that determination. However, it is the CFME's position that Michigan law on highly-automated vehicles helped our state become the epicenter for autonomous vehicle applications and still serves a valuable purpose. It is also our opinion that these laws should be viewed as good, initial steps and that there more progress to be made.

³⁹ [NCSL](#)

When it comes to electrification-based policies, the Michigan policy landscape is more stark. An initial view of the landscape reveals that across the nation, the electrification policy is evolving swiftly, being led by a few key geographies. Emerging policies center around infrastructure development, emissions reduction and vehicle adoption. Michigan law does not appear to cover many transportation electrification issues. The CFME has no specific policy recommendations at this time but believes that going forward Michigan will need to spend more time and resources developing what we believe are good electrification policies.

State infrastructure policy serves to accelerate the expansion of EV charging infrastructure, addressing topics ranging from charging station insurance requirements, to the designation of appropriate highway signage indicating charging stations. Most frequently, policy centers around the proportionate, equitable and adequate distribution of charging infrastructure. Specifically, policies serve to enable the installation of charging infrastructure at state parks, beaches, schools and other strategic public locations; some further offer incentives to grant priority to schools located in disadvantaged communities.⁴⁰ Hawaii offers rebates for the installation or upgrade of EV charging systems.⁴¹ To boost grid integration, some states, including California, have policies requiring the Public Utilities Commission to identify and execute strategies to advance vehicle-grid integration in support of electrification.

In conjunction with emission and air pollutant reduction goals, some policies aim to boost the adoption of Zero-Emissions Vehicles (ZEVs). A primary example of this is California's mandate that by 2035, new cars and passenger trucks sold in the state are to be ZEVs.⁴² California is joined by several states with ZEV mandates, including Massachusetts and New York. Other states without strong legal mandates have non-binding targets to determine future plans, such as the required plan formulation in Colorado set for completion in 2021 with state stakeholders. Future policy should explore mechanisms to ensure that energy supplied at charging stations is sourced to renewable supply in order to tightly link transportation electrification to state climate or emissions goals, either through a new RPS (Renewable Portfolio Standard) or other policy mechanisms.

Roughly 18 states, including Michigan, have policies that deter EV adoption by requiring additional EV-specific registration fees, which range from \$50 to \$200.⁴³ While such fees are considered a barrier to adoption, they are relatively small in the context of wider purchase price or TCO parity. More critically, several states such as Texas or Michigan have directed powerful early funds from the VW settlement towards replacing older diesel with new diesel, propane, or natural gas systems, starving initial electrification efforts within their jurisdiction of compounding early funds. However, in states more impactfully also offer direct incentives for the purchase of EVs and PHEVs, whether through

⁴⁰ [CA A 1082, 2018, California](#); [CA A 1803, CA A 1452, 2018, California](#)

⁴¹ [HI H 1585, 2020, Hawaii](#)

⁴² [ZEV Program 2021, California Air Resources Board](#)

⁴³ [NCSL](#)

the form of a tax credit as in Colorado, a rebate program in California or Delaware, or a sales tax exemption in D.C.⁴⁴ Direct sales legislation, such as that enacted in Colorado, improves access to electric vehicles by allowing direct sales.⁴⁵ Adoption of EVs can also be incentivized through fleets, securing procurement priority for electric vehicles for state and county fleets, as seen in states such as Hawaii.⁴⁶ Further fleet incentive programs are also offered by utilities, which assist in encouraging purchase or ownership cost parity.

Overall, through the efforts of the CFME, emerging policies around electrification in the broader context of mobility advancement will be evaluated in greater detail. This initial glimpse at state EV policy across the nation reveals opportunity for Michigan to shape policy that will help to expand EV adoption for both the movement of goods and people in a way that promotes economic development, reduces emissions and advances Michigan's global leadership in mobility.

The most important outcome of our work are the benefits for Michigan residents and travelers. This is especially true for those such as persons with disabilities, low- and marginal-income residents and others who can't operate traditional vehicles.

Policies which align with these possibilities to allow greater mobility for Michigan residents should be part of the work of this council. Some examples of the policy changes will be simple, like changing driver license requirements for persons operating Level 4+ automated vehicles. Others may focus on introducing new vehicles to the marketplace designed with adaptive and enabling technology. New thinking and adaptability in mobility across modes and through different payment systems can likewise be practical innovations. In each of these areas, Michigan intends to lead and especially because it is the right thing for our residents.

Michigan AV policies once had us firmly out in front of the race to attract and support the future of mobility. But many states have caught up to us. The good news is we are still the frontrunners in terms of envisioning where mobility can take us and, as a state, are intrepid to be the first to take on the next, new idea. While our electrification policies are perhaps not as robust as they could be, we do not need to be the first through the wall on those policies and can rapidly replicate and build off the work of our fellow states. Overall, Michigan state policies have been on the right track, we have room to grow and we will be pursuing those opportunities in future reports from this council.

The promise of technology is that we can remove practical and technical barriers to their independence in travel and improve quality of life.

⁴⁴ [PEV Tax Credit, Colorado, AFDC](#); [PEV Rebate Program, California, AFDC](#); [AFV Rebates, Delaware, AFDC](#); [PEV Title Excite Tax Exemption, AFDC](#)

⁴⁵ [CO S 167, 2020, Colorado](#)

⁴⁶ [HI S 661, 2020, Hawaii](#)



Summary

Michigan is still a global leader in the future of mobility and electrification.

But the margin of our lead has been closing. It is the hope of the Council on Future Mobility and Electrification that the establishment of our own council, the establishment of the new Office on Future Mobility and Electrification and the willingness to seek out and take on projects like the world's first connected and automated vehicle corridor, signal Michigan's continued commitment to be innovators and pioneers in the future of mobility and electrification space. We look forward to our subsequent reports and offering tangible policies that will keep Michigan at the vanguard of the Mobility Revolution.

Inquiries to the Council on Future Mobility
and Electrification can be submitted to
LEO-CFME@michigan.gov.