EXECUTIVE SUMMARY

E-MOTOR MODULE

GLOBAL EPICENTER OF MOBILITY
REVOLUTIONIZING THE DETROIT REGION

Detroit Regional Partnership

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IN THIS SUMMARY

The Global Epicenter of Mobility (GEM), a signature program of the Detroit Regional Partnership (DRP), is designed to enable growth and development of the advanced mobility industry in the 11-county Detroit Region. GEM and its strategic partners work together to create a smart, secure, and sustainable advanced mobility industry in Southeast Michigan. GEM's efforts were made possible by a four-year U.S. E.D.A. Build Back Better Regional Challenge grant award.

As part of its work, GEM provides its grant partners and regional stakeholders with key mobility sector research, data, and insights. In 2024, GEM commissioned a Future Mobility Technology Study (FMTS) in collaboration with S&P Global Mobility. The FMTS is a comprehensive report that identifies the seven advanced mobility technologies with the strongest mid-term growth potential in the Detroit Region. Together with supporting data from other key sources, FMTS serves as the foundation of the Road to 2030 website.

This website covers the key insights from the FMTS, as well as other reports and key sources. Our content includes an executive summary of opportunities stemming from each of the seven technologies covered in the FMTS. The executive summaries, as well as a corresponding section of the Road to 2030 website, will be released over the course of the year. This executive summary, the third in our series, is focused on E-motors.

The Future Mobility Technology Study (FMTS) is a comprehensive report of the seven advanced mobility technologies with the strongest mid-term growth potential in the Detroit Region.

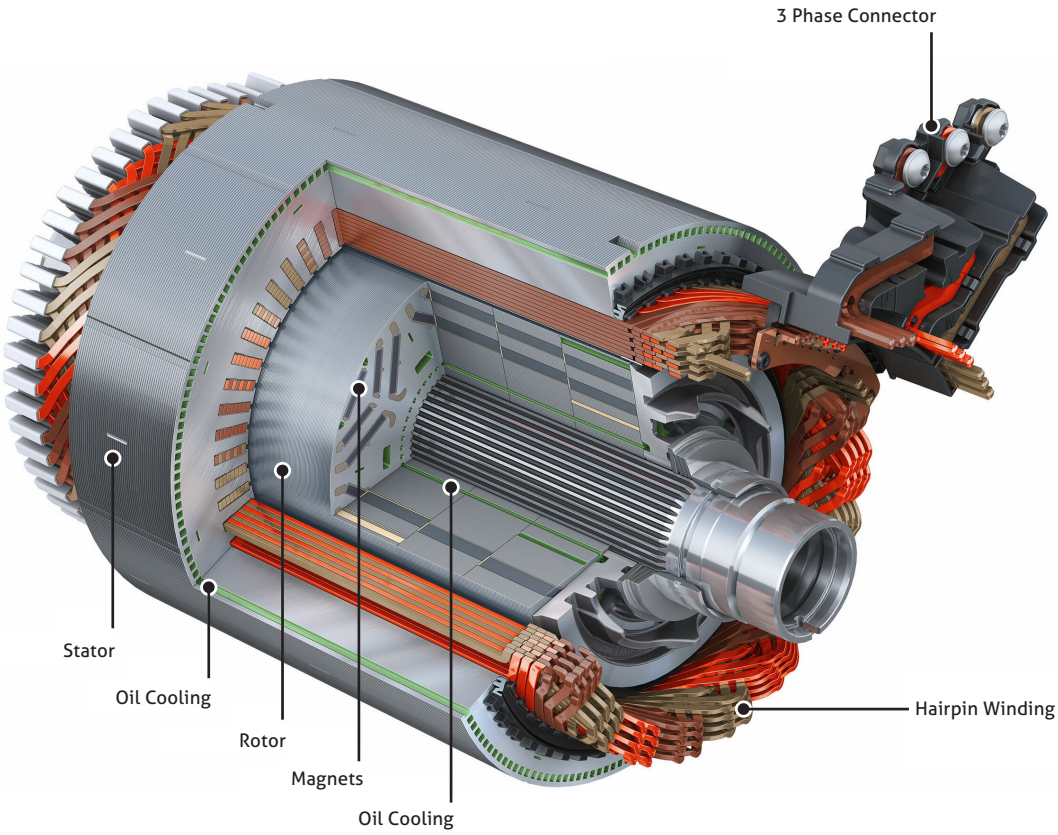
E-MOTOR INTRODUCTION

Electric motors (E-motors) are a key component of electrified vehicles of all types, ranging from hybrid to full battery electric vehicles. They convert electrical energy, typically from a propulsion battery, into mechanical energy. By alternating magnetic fields between a stator (typically coils of wire) and a rotor, electric motors create rotation to spin a drive shaft that can be used to propel a vehicle or for other mechanical purposes. While wheeled vehicles may use as few as one E-motor for propulsion, some use as many as four – one to drive each wheel. Similar dynamics are true for other mobility sectors, in which vehicles like watercraft or drones may use a system of multiple E-motors for propulsion.

Figure 1:

E-MOTOR STRUCTURE AND COMPONENTS

SOURCE: AUDI AG



Vehicles use a wide range of electric motors for purposes ranging from running Heating, Ventilation, and Air Conditioning (HVAC) systems to power windows and seats. The E-motors covered in this research are those used specifically for vehicle propulsion, which feature more advanced and robust designs to provide the power and durability necessary for vehicle propulsion applications.

While wheeled vehicles may use as few as one E-motor for propulsion, some use as many as four – one to drive each wheel.

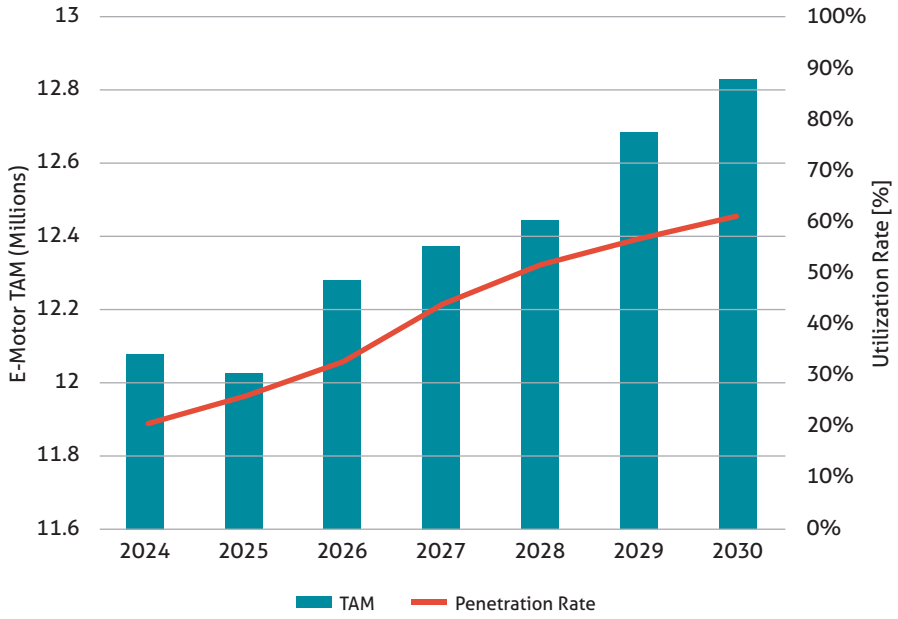
PRODUCTION & EMPLOYMENT GROWTH FORECASTS

Chart 1:

E-MOTOR TAM & PENETRATION RATE, ALL U.S. MOBILITY SECTORS

SOURCE: S&P GLOBAL LV/ MHCV/OFF-HIGHWAY PRODUCTION FORECASTS, S&P GLOBAL ANALYSIS WITH INDUSTRY SOURCES (GAMA, NMMA, FAA, AUVSI)

**NOTE: THE TECHNOLOGY PENETRATION RATE IS CALCULATED FROM THE TECHNOLOGY TOTAL ADDRESSABLE MARKET (TAM) OF ALL RELATED MOBILITY SECTORS.*



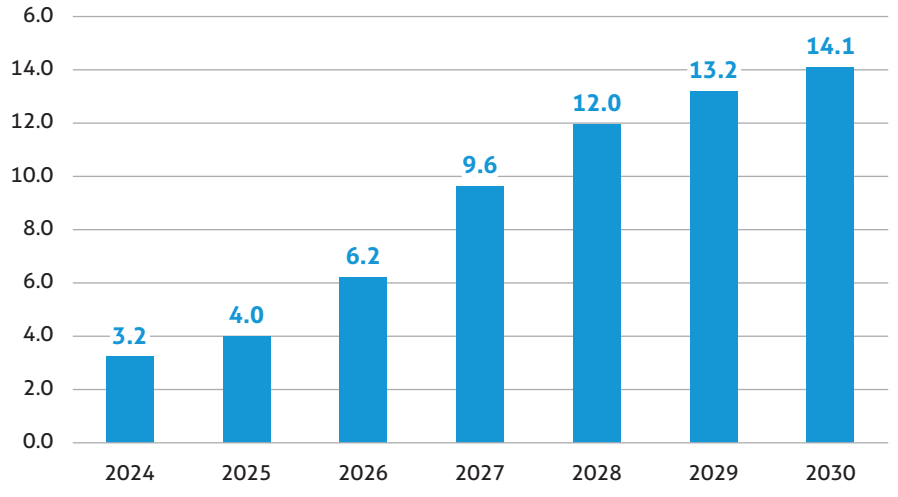
The E-Motor technology penetration rate for all U.S. mobility sectors is projected to more than triple from 20.5% of the Total Addressable Market (abbreviated as TAM, the Total Addressable Market is the total number of vehicles produced on which a given technology can potentially be deployed) in 2024 to 61.0% by 2030. This indicates that 61% of all vehicles produced in the United States in 2030 will include at least one E-motor for propulsion.

Over this timeframe, the TAM of all mobility sectors combined is forecast to increase from 12.1 million units in 2024 to 12.8 million in 2030.

Chart 2:

E-MOTOR PRODUCTION, ALL U.S. MOBILITY SECTORS

SOURCE: S&P GLOBAL LV/ MHCV/OFF-HIGHWAY PRODUCTION FORECASTS, S&P GLOBAL ANALYSIS WITH INDUSTRY SOURCES (GAMA, NMMA, FAA, AUVSI)

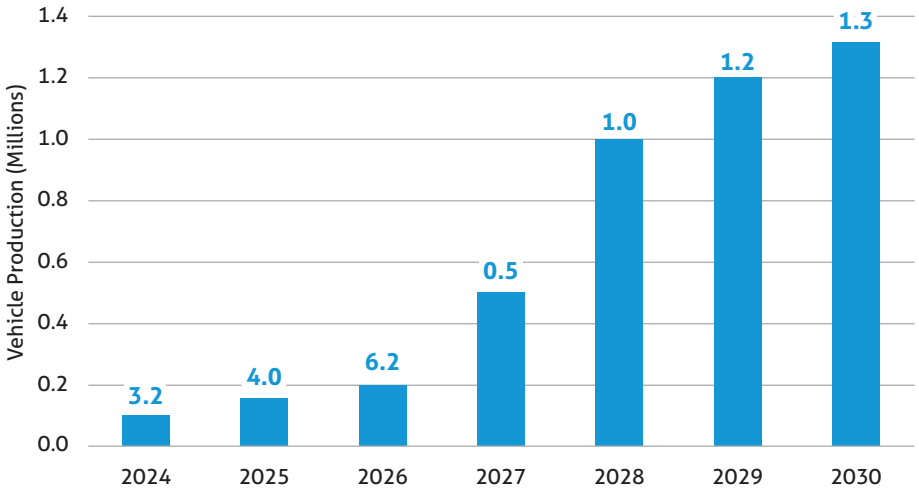


Total U.S. E-Motor production for all mobility sectors is forecast to grow significantly, from 3.2 million in 2024 to 14.1 million by 2030. This growth represents a 341% increase from 2024 levels.

Chart 3:

MICHIGAN LIGHT VEHICLE E-MOTOR PRODUCTION

SOURCE: S&P GLOBAL SOFTWARE VEHICLE DOMAIN FORECAST, JULY 2024



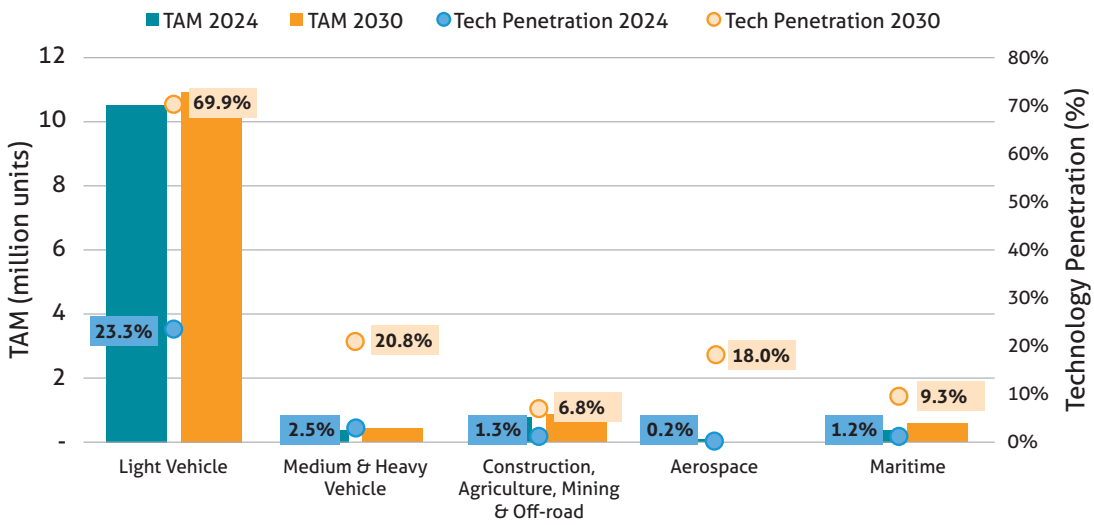
Light Vehicles are the mobility sector of greatest significance to Michigan and the Detroit Region. Michigan E-Motor production for Light Vehicle applications is forecast to increase from just under 100,000 units in 2024 to over 1.3 million units in 2030 – an increase of more than 1,200%.

Chart 4:

U.S. E-MOTOR TOTAL ADDRESSABLE MARKET (TAM) AND PENETRATION RATES

SOURCE: S&P GLOBAL LV/ MHCV/OFF-HIGHWAY PRODUCTION FORECASTS, S&P GLOBAL ANALYSIS WITH INDUSTRY SOURCES (GAMA, NMMA, FAA, AUVSI)

**NOTE: THE TECHNOLOGY PENETRATION RATE IS CALCULATED FROM THE TECHNOLOGY TOTAL ADDRESSABLE MARKET (TAM) OF ALL RELATED MOBILITY SECTORS.*



While the light vehicle mobility sector remains the largest opportunity for E-motor applications through 2030, other sectors are also expected to experience significant growth in electrification.

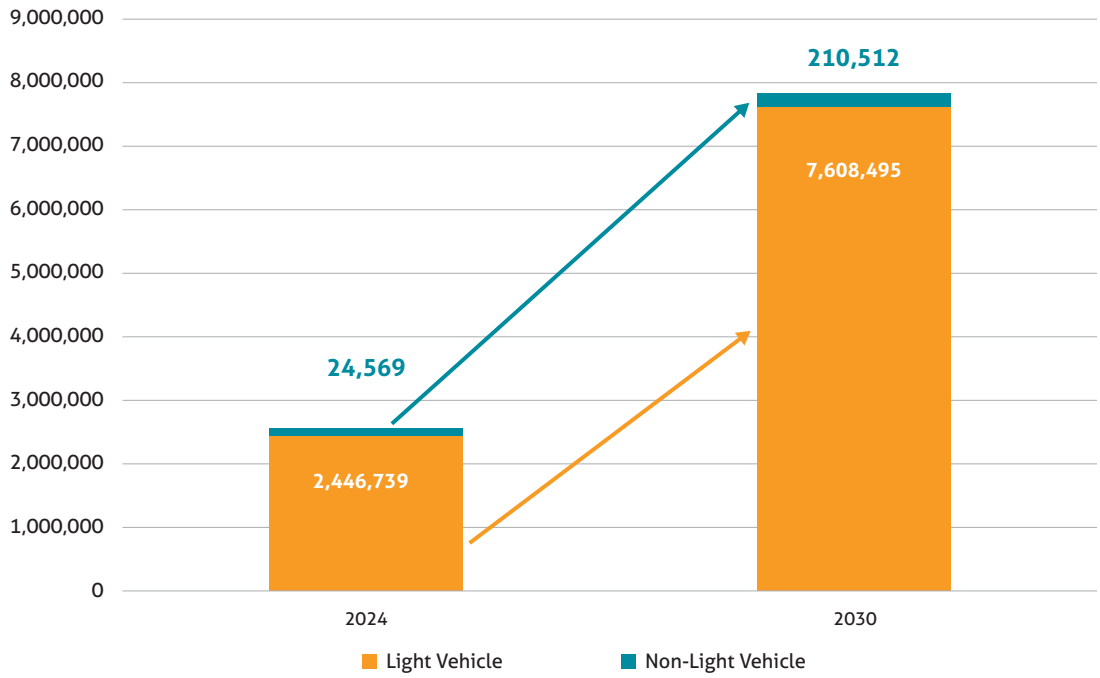
- **Medium- and heavy-duty vehicles:** E-motor adoption in this mobility sector is projected to rise from 2.5% in 2024 to 20.8% in 2030.
- **Aerospace:** Although total unit volumes remain relatively low—just over 4,000 units by 2030—the E-motor penetration rate is expected to grow from 0.2% in 2024 to 18% in 2030. In June 2025, the Trump Administration announced several executive orders intended to advance U.S. development and production of drones and electric Vertical Takeoff and Landing (eVTOL) aircraft. The executive orders are intended to "accelerate the development, testing, and scaling of American drone technologies, including advanced air mobility and autonomous operations" and may further accelerate E-motor production for the Aerospace sector.
- **Maritime:** E-motor application is forecast to increase from 1.2% in 2024 to 9.3% in 2030.

These forecasts include both fully battery-powered vehicles and hybrid or plug-in hybrid models that incorporate internal combustion engines.

Chart 5:

U.S. E-MOTOR PROJECTED GROWTH BY MOBILITY SECTOR

SOURCE: DRP/GEM ANALYSIS OF DATA FROM S&P GLOBAL AUTOMOTIVE



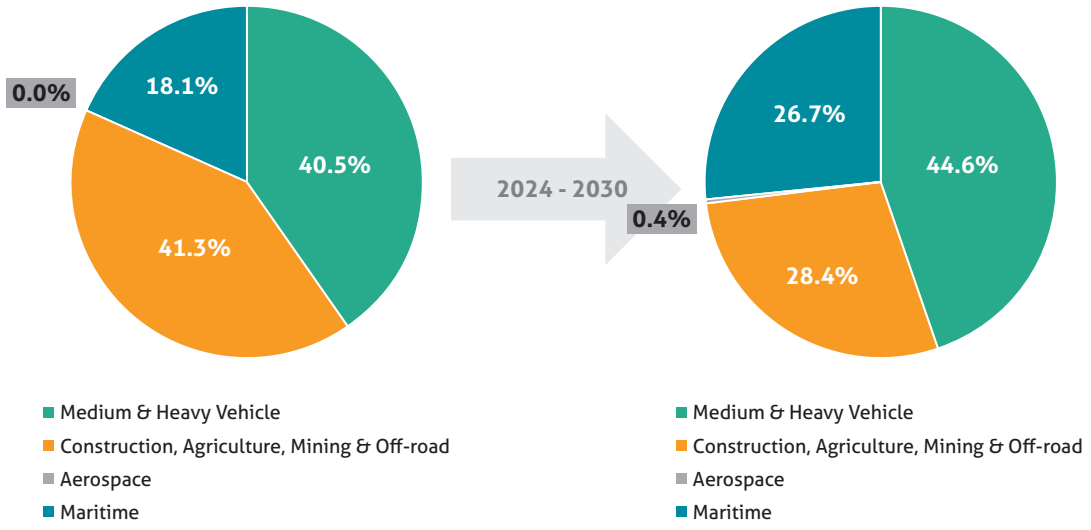
U.S. E-motor demand for light vehicles is forecast to nearly triple between 2024 and 2030 reaching a level of over 7.6 million units.

Over the same time-period, E-motor demand for non-light vehicle mobility sectors is forecast to increase by 757% to over 210,000 units.

Chart 6:

U.S. NON-LV SECTOR E-MOTOR SHARE FORECAST

SOURCE: DRP/GEM ANALYSIS OF DATA FROM S&P GLOBAL AUTOMOTIVE



While light vehicles will continue to represent the highest volume use for E-motors, other mobility sectors are expected to undergo transformative shifts in electrification and E-motor deployment through 2030.

- Construction, Agriculture, Mining, and Off-road: Applications for this sector dominated U.S. E-motor demand for non-light vehicle mobility sectors in 2024, with a share of 41.3%.
- Medium- and heavy-duty vehicles: Forecast to increase from 40.5% in 2024 to nearly 45.0% in 2030.
- Maritime: Applications are expected to increase from 18.1% in 2024 to 26.7% in 2030.

Although aerospace applications are expected to grow in penetration, low production volumes will limit their share to just 0.4% of non-light vehicle E-motor applications by 2030.

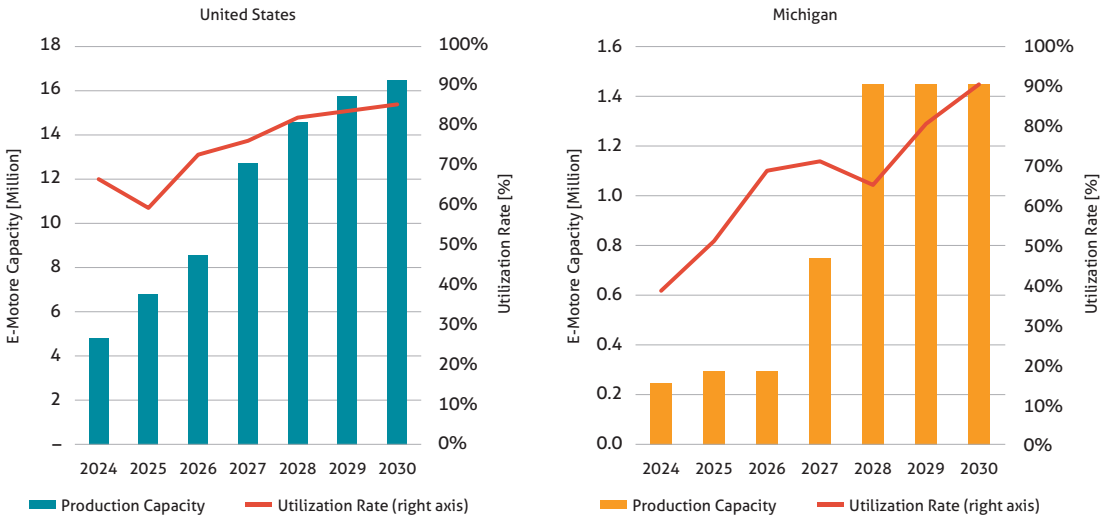
CAPACITY AND UTILIZATION

Chart 7:

U.S. & MICHIGAN E-MOTOR PRODUCTION CAPACITY AND UTILIZATION RATES

SOURCE: S&P GLOBAL BASED ON E-MOTOR FORECAST

NOTE: CAPACITY INCLUDES LV SECTOR ONLY



To meet the significant growth forecast for electric vehicle production, vehicle manufacturers and suppliers have announced significant investments in production facilities. U.S. E-motor production capacity for light vehicles is forecast to grow more than threefold from 4.8 million in 2024 to 16.5 million in 2030. The U.S. capacity utilization rate is expected to reach 84% in 2030.

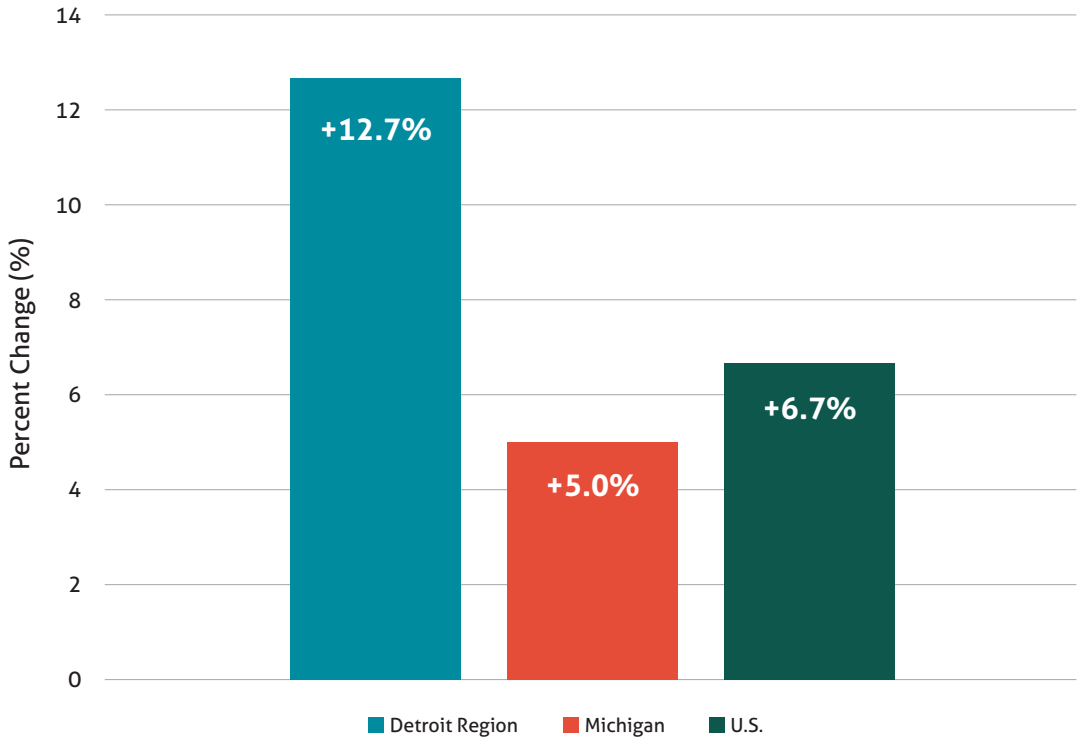
Michigan E-motor production capacity for light vehicles is forecast to grow by 480% from 250,000 in 2024 to 1.5 million in 2030. The capacity utilization rate is expected to reach 91% in 2030. These production volumes have the potential to grow with the need to supply E-motors for other mobility sectors as they undergo their own electrification transitions.

EMPLOYMENT IMPACTS AND FORECASTS

Chart 8:

U.S. AND MICHIGAN E-MOTOR PRODUCTION EMPLOYMENT

SOURCE: LIGHTCAST DATA AND FORECAST FOR NAICS 335312



EMPLOYMENT IMPACTS AND FORECASTS (CONT.)

The U.S. Bureau of Labor Statistics (BLS) includes E-motor production in North American Industry Classification System (NAICS) 335312. Between 2020 and 2030, employment in included jobs is forecast to increase by 6.7% nationally, 5.0% in Michigan overall, and 12.7% in the Detroit Region – nearly double the growth expected nationwide. E-motors are also produced at automaker engine and transmission manufacturing facilities alongside powertrain products intended for conventionally powered vehicles. While breakouts of the share of employees making E-motors at these facilities are not available, it is important to note that as the transition to electrified powertrains continues, the employment at these facilities is also shifting to components like the E-motors discussed in this report.

EMPLOYMENT IMPACTS AND FORECASTS

The Detroit Region is a global leader in the development and production of electrified powertrain components, including E-motors. Perhaps the best example of this leadership is the Ford Van Dyke Electric Powertrain Center in Sterling Heights. Initially serving as a production facility for conventional light vehicle transmissions, the facility was renamed as the Van Dyke Electric Powertrain Center in 2021. While production for Internal Combustion Engine (ICE)-powered vehicles continues, the facility now also produces E-motors and E-transaxles for electrified vehicles, as well. As of April 2024, the Van Dyke Electric Powertrain Center employed nearly 1,500 workers. As a facility transitioning from producing powertrain products for ICE-powered vehicles to those for electrified vehicles, the Ford Van Dyke Electric Powertrain Center is a key example of this transformation unfolding across the Detroit Region.

IMAGE SOURCE: FORD MEDIA NEWSROOM

CONCLUSION

E-motors, like propulsion batteries, are at the heart of the electrification transformation of the mobility industry. They present the Detroit Region with a critical opportunity to capitalize on this transformation while maintaining technological and production leadership. In addition to helping the Detroit Region maintain its leadership in light vehicle propulsion, E-motor leadership can help the region branch out into additional mobility sectors as they undergo their own electrification transformation. As a result, E-motors play a vital role in supporting the Detroit Region's leadership in advanced mobility initiatives.

To learn more about GEM, please visit us at
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