

## FUTURE MOBILITY TECHNOLOGY STUDY (FMTS) HYDROGEN FUEL CELL SYSTEMS SUMMARY



# INTRODUCTION



## **HYDROGEN FUEL CELL SYSTEMS TECHNOLOGY**

+31,500 Unit Growth

In the U.S. from 2024-2030

46.5% of Growth in Non-Light Vehicle

**51.6% of Growth in Light Vehicle** 

## 0.3% Tech. Penetration

Projected rate among all U.S. mobility sectors by 2030

**1.7% Tech. Penetration** for Med. Heavy Vehicle

**1.1% Tech. Penetration** for Maritime Nearly 1,700 New MI Jobs By 2030

+1,250 New Light Vehicle Jobs

+440 New Non-Light Vehicle Jobs



## **KEY HYDROGEN FUEL CELL SYSTEM COMPONENTS**



- A high-pressure storage tank, together with the fuel cell stack, are the two chief components of a hydrogen fuel cell system.
- Other key components include a cooling system and compressor.





# **DATA & FORECASTS**

The **hydrogen systems technology penetration rate is projected to reach 0.3%** of the total TAM of all U.S. mobility sectors.

But the total hydrogen system unit production is projected to increase notably from only 569 units in 2024 to more than 32,000 units in 2030.

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 TAM from all the related mobility sectors' TAM.

### FCEV Technology Penetration Rate, All U.S. Mobility Sectors







## HYDROGEN TECHNOLOGY PENETRATION AND U.S. MOBILITY SECTORS TAM

TAM 2024 TAM 2030 • Tech. Penetration 2024 • Tech. Penetration 2030 2.0% Technology Penetration (% 12 TAM (Millions units) 1.8% 1.7% 10 1.6% 1.4% 8 1.2% 0 1.1% 1.0% 6 0.8% 0.7% 4 0.6% 0.4% 2 0.2% 0.2% 0.1% 0.1% 0.0% 0.0% 0.0% 0.0% 0.0% Medium & Heavy Light Vehicle Construction, Maritime Aerospace Vehicle Agriculture, Mining & Off-road

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 TAM from all the related mobility sectors' TAM.

Despite currently low volumes, hydrogen fuel cell systems are forecast to grow significantly in multiple mobility sectors by 2030. The greatest penetration increase is forecast for the Medium & Heavy Duty vehicle sector (growing from 0.1% in 2024 to 1.7% in 2030).



Hydrogen fuel cell systems production is projected to grow nationally more than 56 times, from 569 units produced in 2024 to more than 32,000 total addressable market units by 2030 nationally.

Both light vehicle and non-light vehicle U.S. mobility sectors is expected to grow more than 98% units in the next six years.





Hydrogen fuel cell systems are forecast to experience significant growth for all U.S. mobility sectors in the next six years, notably for the non-light vehicle mobility sectors that will make up nearly half of the total projected volume growth for this technology.







## FCEV PRODUCTION COMPOUND ANNUAL GROWTH RATE (CAGR)

Michigan is forecast to experience a growth rate of 303% in fuel cell technology application for the Light Vehicle sector between 2024 and 2030 – more than triple the growth rates forecast for the U.S. and North America.

Source: S&P Global. Note: NA is for North America, US for United State of America, and MI is for Michigan.

## Hydrogen Fuel Cell Systems Growth Rates



GEORAL EPICENTER OF MOBILITY REVOLUTIONIZING THE DETROIT REGI

Although volumes are still at low levels, medium and heavy-duty vehicles are forecast to be the mobility sector with the greatest potential for high-volume hydrogen fuel cell system deployment (penetration rate of 0.1% in 2024). None of these vehicles are currently forecast to be built in Michigan, presenting the state with a key opportunity.

Mobility Sector	Total Addressable Market (TAM, Units) 2024	Tech. Penetration (%) 2024	Tech. Growth (CAGR) 2024-2030
Light Vehicle	NA: 15.8 Million US: 10.5 Million <b>MI: 1.7 Million</b>	NA: 0% US: 0% <b>MI: 0%</b>	NA: 111% US: 100% <b>MI: 303%</b>
Medium & Heavy Vehicle	NA: 0.65 Million US: 0.40 Million <b>MI: 0.02 Million</b>	NA: 0.05% US: 0.1% <b>MI: 0%</b>	NA: 88% US: 72% <b>MI: 0%</b>
Construction, Agriculture, Mining & Off-Road	US: 0.80 Million	US: 0%	US: 216%
Aerospace	US: 0.003 Million	US: 0%	US: 74%
Maritime	US: 0.37 Million	US: 0%	US: 334%

Source: S&P Global. Note: NA is for North America, US for United State of America, and MI is for Michigan.

## LV HYDROGEN TANK AND FC STACK PRODUCTION

■ South Korea ■ France ■ Japan ■ Mainland China ■ United States ■ Germany ■ Norway ■ Unknown ■ Canada

GLOBAL EPICENTER OF MOBILITY

Partnership

#### Hydrogen Fuel Tank Production Projection by Country

U.S. production of fuel cell stacks is projected to rise from 266 units in 2024 to nearly 9,000 units in 2030 – resulting in U.S. share of global fuel cell stack production rising from 1.9% in 2024 to 8.4% by 2030, a nearly 345% gain. U.S. hydrogen tank production is forecast to increase from 0% currently to 10.2% by 2030.



Hydrogen Fuel Stack Production Projection by Country





## **EMPLOYMENT IMPACT ESTIMATES**



### LIGHT VEHICLE, KEY TAKEAWAYS:

- Considering that fuel cell vehicle production is expected to reach 25,000 units (LV + MHCV) by 2030, this could generate 7,250 new jobs in the United States.
- Narrowing it down to the State of Michigan, fuel cell vehicle production is expected to reach 4,300 units by 2030, generating **1,250 new jobs in the state**.

### **MOBILITY SEGMENTS, KEY TAKEAWAYS:**

- On the high end, if 100% of non-light vehicle/MHVC hydrogen fuel cell sectors emanate from Michigan, it's estimated it would create more than 4,400 direct jobs by 2030.
- Conservatively, if 10% of non-light vehicle/MHVC hydrogen fuel cell sectors emanate from Michigan, it's estimated it would create more than **440 direct jobs by 2030.**

Mobility Sector	2030 FCEV Volume	Conservative Employment	High End Employment
Construction, Agriculture, Mining, & Off-Highway	1,006	~300	~600
Aerospace	28	less than 50	less than 50
Maritime	6,658	~1,900	~3,800

#### **ASSUMPTIONS:**

- Assumption 1: It was assumed that 100% of United States FCEV sourcing for the non-LV/MHCV mobility sectors emanates from Michigan.
- Assumption 2: The same LV FCEV vehicle employment ratio of 2,900 employees for every 10,000 vehicles produced is assumed.
- Assumption 3: Two ranges of employment are considered: Conservative and High End (2x Conservative).
- This assumes a ratio of 2,900 direct employees for 10,000 total systems tank, fuel cell system, bi-polar plates and compressors.
  - Due to scale economies, it is expected that production efficiency would reduce the employee/unit ratio.



#### 2030 HYDROGEN FUEL CELL PRODUCTION EMPLOYMENT GROWTH

By 2030, hydrogen fuel cell production is expected to create 7,250 new jobs in the United States and about 1,250 in Michigan for light vehicles and 4,400 jobs nationwide for other mobility sectors. If a conservative 10% of that production takes place in Michigan, the state would see an additional 440 new jobs added as a result, for a total of nearly 1,700 new jobs in the State.



Source: S&P Global Mobility



