



US DRIVE All Tech. Team Meeting

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on behalf of USCAR

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UNITED STATES COUNCIL FOR AUTOMOTIVE RESEARCH

Disclaimer



None of the information in this presentation should be taken as a projection into the future direction or decisions of the USCAR member companies, Ford, GM, or Stellantis.

The information in the presentation represents USCAR's position and should not be attributed to any individual member.

Who We Are

United States Council for Automotive Research (USCAR)



USCAR is a collaborative, pre-competitive, automotive technology company based in Southfield, Michigan.

Three member companies:

- Ford Motor Company
- General Motors
- Stellantis

Two subsidiaries:

- USABC (U.S. Advanced Battery Consortium)
- USAMP (U.S. Automotive Materials Partnership)



U.S. DRIVE - Sustainability

U.S. DRIVE Vision:

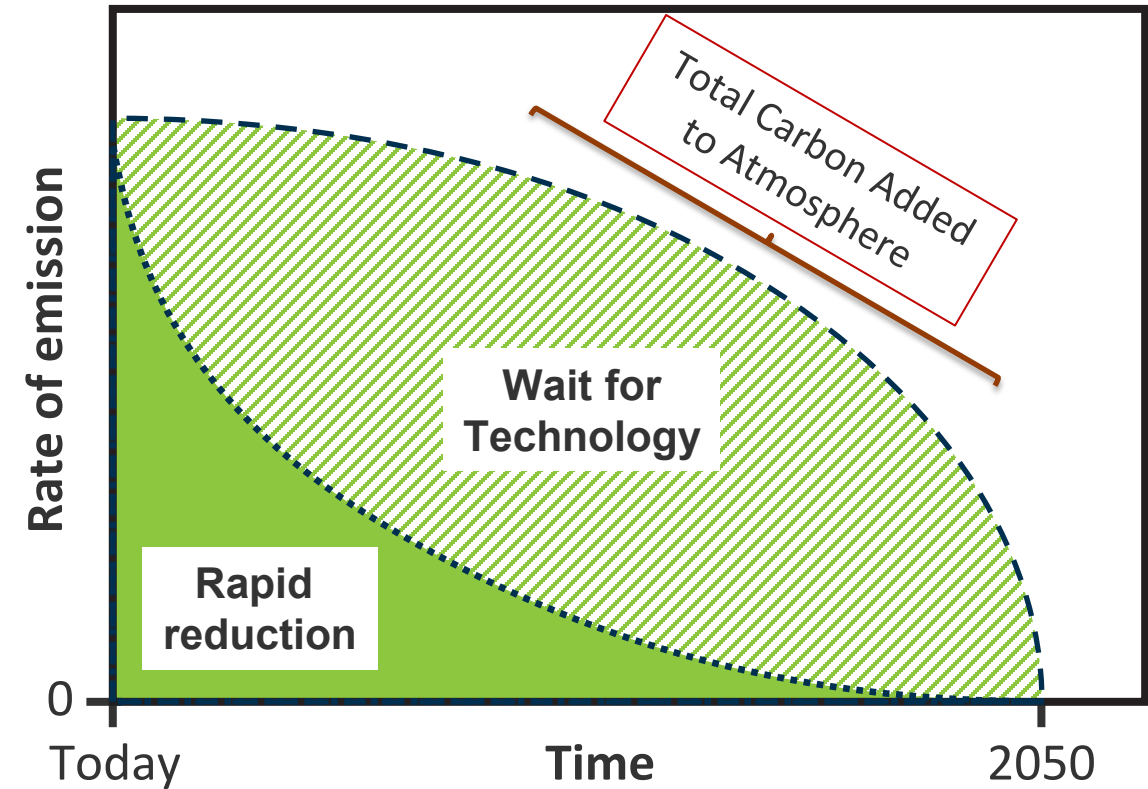
A decarbonized, environmentally responsible on-road transportation, charging, and fueling infrastructure system throughout the United States that is affordable, equitable, and resilient.

U.S. DRIVE Mission:

Accelerate decarbonization through pre-competitive, innovative, and affordable light-duty vehicle related technologies and energy infrastructure to enable the transition to a sustainable transportation energy system.

Source: U.S. DRIVE Partnership Plan (2022)

<https://www.energy.gov/eere/vehicles/articles/us-drive-driving-research-and-innovation-vehicle-efficiency-and-energy>



Courtesy of: McCormick, NREL

- Reducing carbon now is worth more than in the future.
- All areas of the vehicle lifecycle have R&D needs for improved sustainability.

Innovating Tomorrow



A Snapshot of USCAR Activities

Advanced Propulsion
Electrical/Electronics
Energy Storage (USABC)
Hydrogen & Fuel Cell
Manufacturing
Materials (USAMP)
Safety



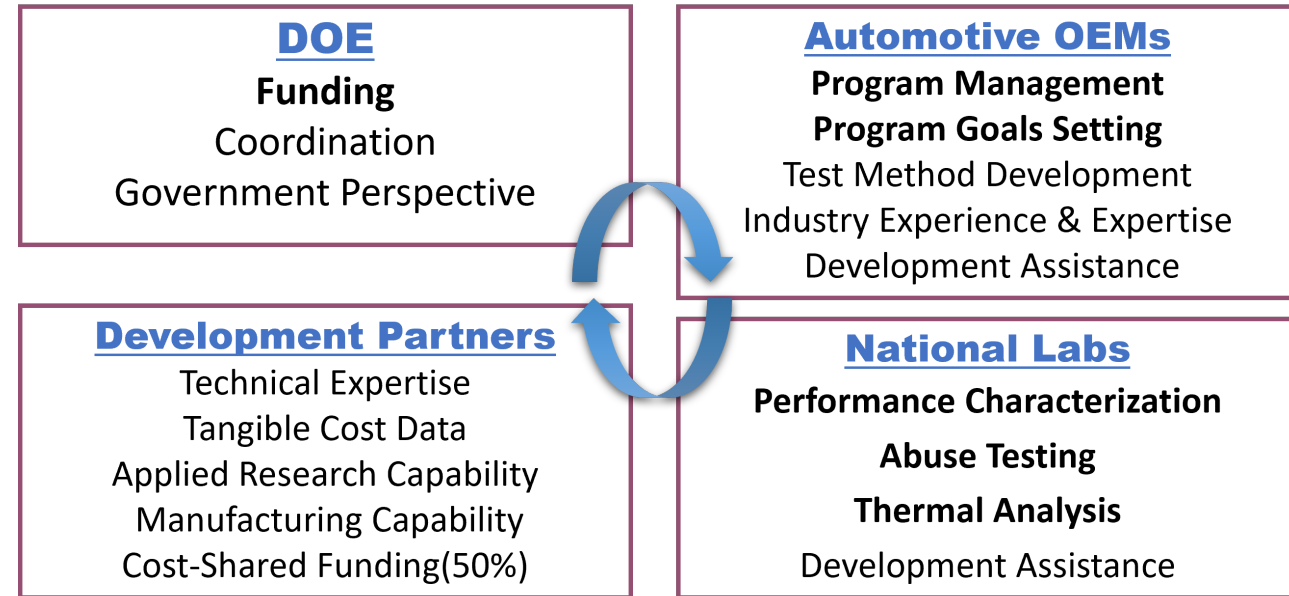
- USCAR activities align closely with U.S. DRIVE
- Every area has a role in sustainability – Even Safety!

Energy Storage

United States Advanced Battery Consortium (USABC)

USABC, a subsidiary of USCAR, operates under a cooperative agreement with the U.S. Department of Energy (DOE).

Mission - Advance the commercialization of next-gen electrified vehicle applications through the development of electrochemical energy storage technologies.



- USABC has been partnered with DOE for over 30 years.

United States Advanced Battery Consortium (USABC)

Four key technology development areas:

1. Advancement of **battery cell technology** to enhance performance while reducing costs, in alignment with the energy density, cost, and fast charging targets.
2. Development of a robust **domestic supply chain** to ensure the ongoing success and mass adoption of electric vehicles in the U.S.
3. Cost positive **end-of-life** battery recycling to support the sustainable development of EV batteries.
4. Development of battery cells for the **next-generation of batteries**.



- USABC DOE Award – DE-FOA-0002965, expected to begin fall of 2024

Grid Integration

Grid Integration

Several questions to address

1. How much coordination of grid related activities should be carried through GITT?
2. Where does GITT fit into this eco-system, what are its unique roles and responsibilities and how can it best serve the industry?
3. Do we have appropriate stakeholder participation?



GITT Roadmap 2023



- Grid integration is key for electrification
- USCAR supports managed charging, but the customer has ultimate control

Materials

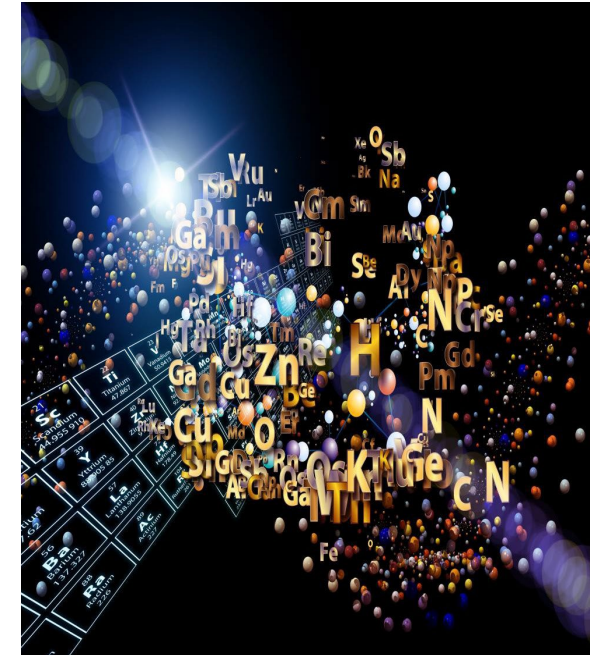
Sustainability

- Each USCAR company has specific targets around Sustainability
- Over the next decade, we aim to increase sustainable and recycled materials in our vehicles
- Aspirational goals include increasing recycled/renewable materials and reducing substances of concern
- New focus on developing consistent definitions, preferred tracking methods, and investigating new technologies.



Prioritized Areas of Interest

1. Sustainable Materials
2. Lightweighting
3. Performance Materials/Functional Materials
4. Critical Materials
5. Materials Benchmarking/Materials Property Data Collection

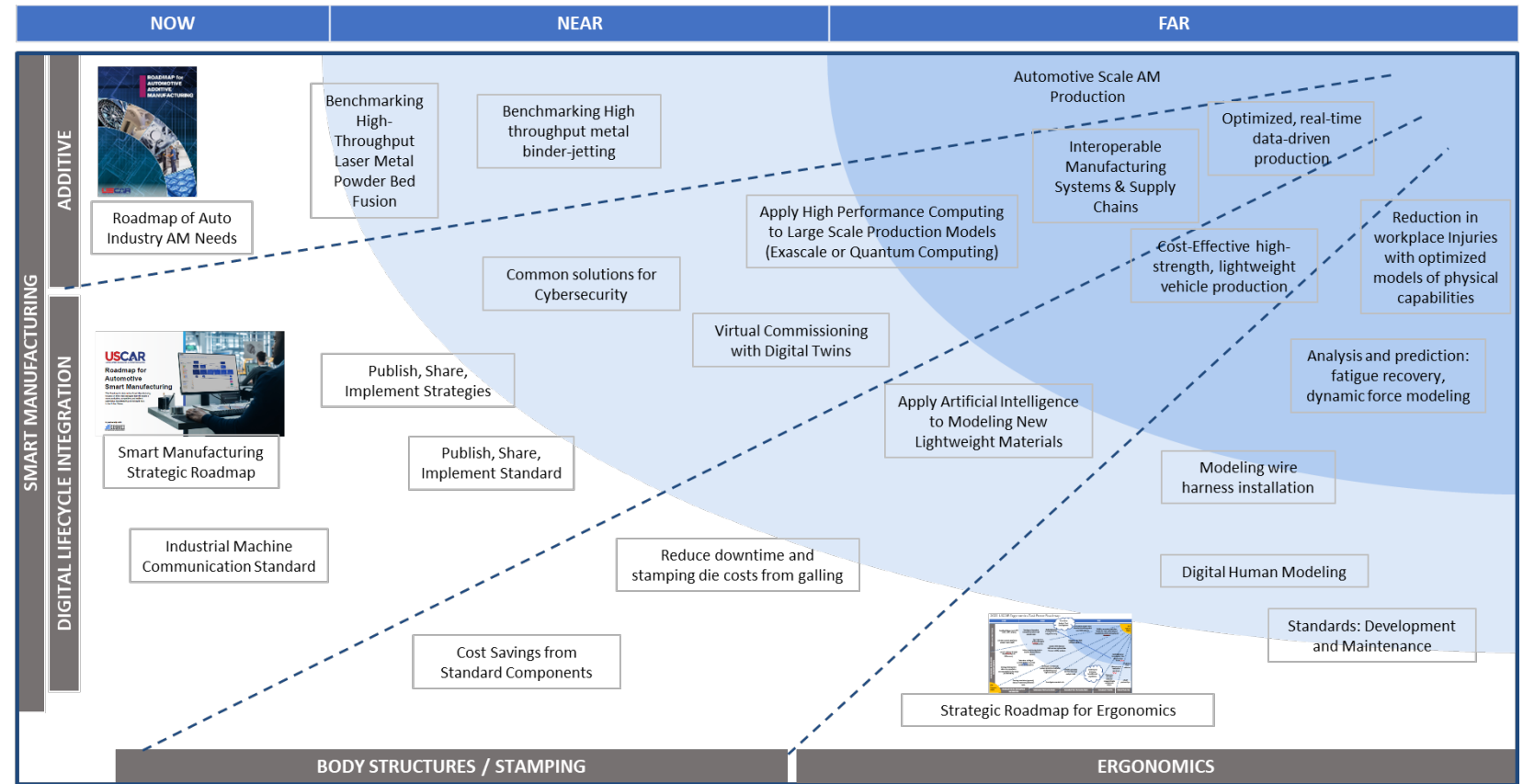


- Materials development is an excellent area for pre-competitive research
- OEMs don't make the materials but do specify them to the supply base

Manufacturing

Manufacturing

- Not a U.S. DRIVE tech. team but closely connected to the materials tech. team.
- Decarbonization efforts in the materials tech. team depend on the ability to make the materials and process them into usable products.



Example: USCAR Smart manufacturing roadmap

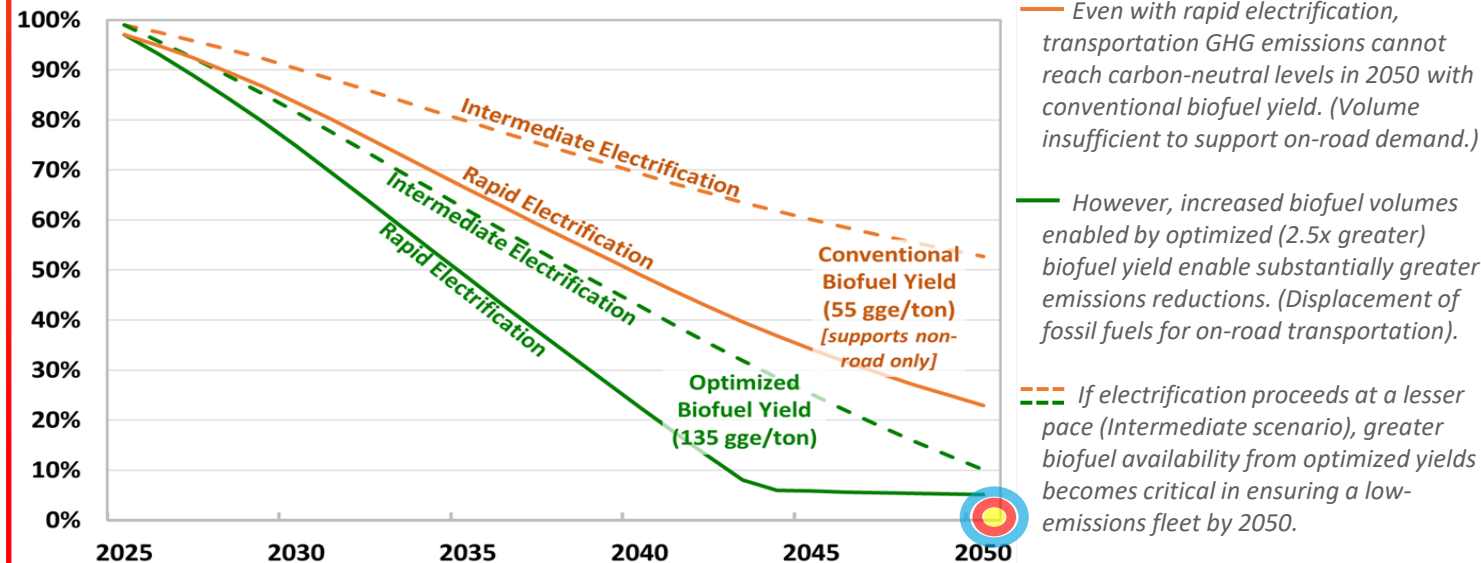
- Manufacturing and materials increasingly linked to sustainability goals.
- Smart manufacturing required for global competitiveness.

Net-Zero Carbon Liquid Fuels

Net-Zero Carbon Liquid Fuels

Electrification Scenario	EV Sales Basis	2050 EV Sales Shares for LD, MD, HD	2050 Liquid Fuels Consumption
1) Slow (Baseline)	DOE 2022 Annual Energy Outlook ⁶	15%, 0%, 0%	232 billion gge
2) Intermediate	Rapid (BNEF) x ½	45%, 39%, 23%	176 billion gge
3) Rapid	BNEF Long-Term EV Outlook 2023 ⁹	89%, 78%, 46%	112 billion gge

Figure 1: U.S. Transportation GHG Emissions Reductions for Scenarios with Rapid or Intermediate Electrification of On-Road Vehicles and with Conventional or High Yields for Biofuel Production



Source: USCAR whitepaper – Low-Carbon Liquid Fuels for U.S. Road Transportation
 Download at <https://uscar.org/news/>

- Very few options to decarbonize the legacy fleet other than fuels.
- Accelerated decarbonization with improved biofuel yield and availability to on-road vehicles.

Hydrogen and Fuel Cells

Hydrogen and Fuel Cells

Infrastructure is a key hurdle for deployment

USCAR OEMS have a unified voice through two Whitepapers:

1. Recognized the importance of medium-duty fuel cell electric vehicles (FCEV) and necessity of their hydrogen stations.
2. Established requirements for mobile stations to support the development of test vehicles and enable the initial deployment of fuel cell electric vehicles at customer sites.

We need a hydrogen station network that is not limited to a vehicle class or application but rather highly compatible, flexible, and reliable to maximize utilization for stations and vehicles.

Continue engagement with 21st Century Truck Partnership and the Regional Clean Hydrogen Hubs to align hydrogen station development, placement, and cost opportunity.

Engaged with medium-duty and heavy-duty FCEV targets.

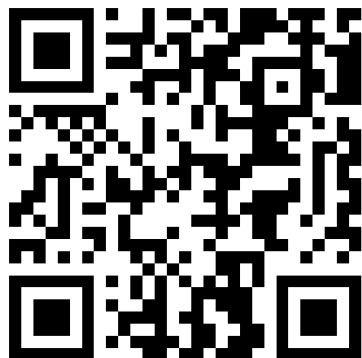
Download whitepapers: <https://uscar.org/technologies-teams/hydrogen-fuel-cell/>

- USCAR members have focused on medium-duty fuel cell electric vehicles and infrastructure.
- Need mobile and stationary infrastructure for medium-duty truck H2 refueling with 20-30kg capacity

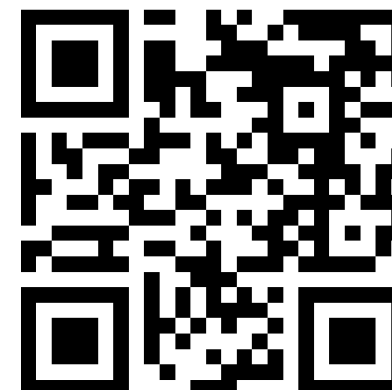


Light-duty HyStep Trailer shown above, used to evaluate the hydrogen station capability to fill according to the J2601 requirements. Similar devices and tools are being developed for medium-duty and heavy-duty hydrogen stations.

Thank you!!



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