Agenda

- Welcome and Announcements
- Introductions
- Public Comments
- MDE Update
- Fuel Cell EV Market and Trends: Perspectives
- Medium- and Heavy-Duty ZEV MOU
- Legislative Update
- Communications Working Group Update
- State Agency Updates
- Utility Updates
- Closing Remarks
Welcome and
Announcements
Deputy Secretary Lewis, MDOT
Introductions
New ZEEVIC Member

Joe Alfred
President, Ally Power Inc.
Fuel Cell EV Infrastructure Equipment Manufacturer
New ZEEVIC Member

David Edmondson
City of Frederick, MML urban/suburban region
New ZEEVIC Member

Nina Forsythe
City of Frostburg, MML Rural Region
EVSE in Downtown Frostburg
New ZEEVIC Member

Jeff Shaw
Vice President, Distributed Energy & Sustainability
SMECO - Electric Company
New ZEEVIC Member

Jason Tai
Tesla/Consultant
Plug-In Electric Vehicle Manufacturer
New ZEEVIC Member

Bob Wimmer

Director, Energy & Environment Research, Toyota
Fuel Cell EV Manufacturer
Public Comments
Volkswagen Settlement – EVSE Funding
Comment Period Open

MDE will accept comments on the two proposed frameworks until C.O.B on October 12th, 2020.

Comments may be submitted to mde.vw@maryland.gov

Volkswagen EVSE Infrastructure program details are available here.
Fuel Cell EV Market and Trends: Perspectives
Bob Wimmer, Toyota
Joe Alfred, API
Toyota Electric Drive Vehicle Update

Robert Wimmer
Director, Energy & Environmental Research
Toyota Motor North America

September 2020
TOYOTA ENVIRONMENTAL CHALLENGE 2050

**Challenge 1**

Tank-to-wheel CO₂ Emissions Compared to 2010

- **CO₂ Emission Challenges**
  - New vehicle Zero CO₂ Emissions Challenge
  - Life Cycle Zero CO₂ Emissions Challenge
  - Plant Zero CO₂ Emissions Challenge
  - Challenge of Minimizing and Optimizing Water Usage
  - Challenge of Establishing a Recycling-based Society and Systems
  - Challenge of Establishing a Future Society in Harmony with Nature

- **Challenge 1**: New vehicle Zero CO₂ Emissions Challenge

- **Challenge 2**: Life Cycle Zero CO₂ Emissions Challenge

- **Challenge 3**: Plant Zero CO₂ Emissions Challenge

- **Challenge 4**: Challenge of Minimizing and Optimizing Water Usage

- **Challenge 5**: Challenge of Establishing a Recycling-based Society and Systems

- **Challenge 6**: Challenge of Establishing a Future Society in Harmony with Nature

- **Graph**: 90% Reduction in average new vehicle CO₂ (TWh)

- **Timeline**:
  - 2010
  - 2050
Toyota Electric-Drive Product Offerings

- **Compact/Medium**
  - Corolla Hybrid
  - Prius
  - Prius AWD

- **Large/Premium**
  - Camry Hybrid
  - Avalon Hybrid
  - ES 300h
  - LC 500h
  - LS 500h

- **SUV**
  - RAV4 Hybrid
  - Highlander Hybrid
  - UX 250h
  - NX 300h
  - RX 450h

- **Plug-In Electric**
  - Hydrogen Fuel Cell

- **Commercial**
  - UNO FC Utility Tractor Rig (prototype)
  - FC Box Truck (prototype) (Japan)
  - Portal FC Truck (prototype)
  - Sora FC Bus (Japan)

- **Best selling**
  - PHEV in U.S.
  - FCEV

- **Coming in 2021**
  - Mirai II FCEV
  - RAV4 Prime

- **Lexus Hybrid**
  - Venza

**Sustainability & Regulatory Affairs**
Light-Duty Vehicle and Station Status

- Latest 4-nozzle, 1200kg/day station in Fountain Valley, CA can refuel 300-400 FCEVs/day
- One fueling standard like gasoline vehicles

United States
- 8000+ FCEVs on the road (6000+ Mirai)
- 42 H₂ stations open in California
  - 22 under construction or funded
  - Awards proposed for +120 stations
- Cost / capacity declining rapidly
- Stations coming on-line in Northeast

Northern California

Southern California
Toyota Demonstrating HD-FCEV Drayage Application

Regional & Global Benefits
- Elimination of particulate and NOx emissions from vehicle
- Health benefits for communities near port & highways
- Quick refueling
- Low / zero carbon fuel options

Results to Date
- 3 prototype trucks undergoing real-world tests
- Production truck deliveries beginning soon
- Vehicle learning will reduce future costs
- Development of high capacity refueling equipt.
- Next gen equipment significantly lower cost

$82M “Shore-to-Store” ZANZEFF* Project

$41M

Funding Agency

Project Manager

$41M

OEM Manufacturer

ZEV Powertrain

Station Developer

* 10 FCEV Class 8 On-Road Trucks
* 2 High Capacity Heavy-Duty Hydrogen Fueling Stations

Video of Prototype FCEV tractor trailer:
https://www.youtube.com/watch?v=4hLw38rYsZY

Truck Operators
- Toyota Logistical Services (4)
- United Parcel Service (3)
- Total Transportation Services (2)
- Southern Counties Express (1)

Sustainability & Regulatory Affairs

* Zero-Emission & Near Zero-Emission Freight Facilities
Diversification is Necessary for Growth & Success

- **Passenger Vehicles**
  - Performance improvement & cost reduction
  - FC technologies
- **Commercial Vehicles**
  - Substantial hydrogen consumption

**Hydrogen (H₂)**
- Wind
- Solar
- Electrolysis
- Natural Gas
- CCS
- Bio Gas

Increase in H₂ demand contribution to infrastructure development

Sustainability & Regulatory Affairs
NE FCEV Expansion

Progress
- MA DOT and Boston Fire positive on allowing light-duty FCEVs in Boston area tunnels
- Toyota & Air Liquide developing 10 H₂ stations in Boston area, 4 complete
- TCI (Transportation Climate Initiative) revenues could fund incentives for vehicles and future stations

Challenges
- Leasing and permitting of new station sites in downtown locations
- Limited state and federal funds for station development
- Need to restart tunnel discussion in NYC metro area

MD Status
- FCEVs prohibited from using Harbor tunnels. Need to understand MD Tunnel Authority concerns
- State ban on some hydrogen production processes in 2026, problematic for station providers
- Intend to work with TCI to develop funding mechanism for H₂ infrastructure in MD
Thank You For Your Attention
Mission statement:
Moving America from Gasoline to Green
The State of Hydrogen

- As of August 2020 – 44 publicly available hydrogen fueling stations. Of those 42 are in California
Where Are We?

The State of Hydrogen

- There are about 8,000 hydrogen fuel cell vehicles on the road
- Sales peaked in 2018, with a small drop in 2019
The State of Hydrogen

Of the major automakers –
- Cummins
- GM
- Honda
- Hyundai
- Mercedes
- Toyota
- Volvo
The problems - Infrastructure

44 publicly available stations are barely enough to begin to study hydrogen vehicle benefits.

With 40 of those being in CA, the vast majority of vehicle owners probably don’t even know that hydrogen vehicles exist.

Until you can drive a vehicle through every one of the contiguous 48 states, hydrogen will not be a viable consumer option.
The problems - Pollutio

As of 2019, 98% of hydrogen is produced by steam methane reforming, which emits carbon dioxide.

Recent Maryland legislation banned the sale of hydrogen produced through steam methane reformation.

The bulk of hydrogen is also transported to fueling stations in trucks, so pollution is also emitted in its transportation.
The problems - Cost

Hydrogen fuel prices range from $12.85 to more than $16 per kilogram.

That is roughly the equivalent on a price per energy basis to $5.00 - $6.00 per gallon of gasoline.

Currently, automobile manufacturers and dealers are subsidizing the consumer hydrogen market.

State funding still subsidizes the hydrogen market in California, but the state plans to phase out those subsidies.
The problems – Supply

Most hydrogen is produced offsite and delivered by trucks to multiple hydrogen stations.

An interruption at just one production site can shut down several stations, leaving vehicle owners with zero refueling options.
American consumers overwhelmingly believe that electric vehicles:

- Don’t have enough charging stations
- Don’t offer enough driving range
- Are too expensive
- Aren’t available in models that they want to buy
solutions
Experts believe hydrogen fuel cells strengths are in long haul and heavy use truck markets. But that infrastructure needs to be built.

Automakers, green energy companies and other investors are willing to partner with states to build that infrastructure.

Once the trucking infrastructure is built, it will be easy to layer the infrastructure needed to serve passenger vehicle market.

States are moving forward – See CA and WGA ZEV Infrastructure Roadmaps.
Companies, like Ally Power, are experimenting with new and old methods of hydrogen production, with varying levels of “green.”

Because of investments of industry and governments, greener options are consistently being brought forward.
As experimentation drives hydrogen to further down the green scale, it also drives down costs, both of hydrogen and fuel cell vehicles.

Companies like Ally Power are looking to cut the price of hydrogen in half, making the cost comparable to, if not lower than, the price of gasoline equivalent.
The pipelines that are currently moving natural gas around the country can be used to move hydrogen gas.

Companies like Ally Power are looking at smaller-scale production facilities that will ensure ample supply of hydrogen, and significantly reduce the need for hydrogen delivery.
Hydrogen fuel cells reduce some of the most significant barriers consumers give for not considering an electric vehicle: vehicle range and length to charge.

States can invest to help solve the greatest barrier – that it’s hard to find stations.
Medium- and Heavy-Duty ZEV MOU

Deputy Secretary Lewis, MDOT
Legislative Update
Jeff Tosi, MDOT
Communications Working Group Update
Colleen Turner, MDOT
Website Analytics

August 1 – August 21, 2020

Page Views: 1,869

Audience Overview:
Search Traffic*: 57%
Referral Traffic: 15%
Direct Traffic: 28%

Top Pages Visited:
1. Incentives: 856 (45%)
2. Homepage: 509 (27%)
3. Charging: 163 (8%)
4. ev-101: 115 (6%)
5. hydrogen-101: 64 (3%)
6. resources: 35 (1%)
7. resources/useful-links: 28 (1%)
8. resources/ev-calculators: 27 (1%)

Top Referral Traffic:
1. bge: 38%
2. pepco: 19%
3. delmarva: 6%
4. firstenergycorp.com: 6%
5. smeco.coop: 4%
6. facebook.com: 3%
7. pinterest.com: 2%
8. solarunitedneighbors.org: 2%
Website Analytics

August 1 – August 31, 2020
Social Media Analytics

Highlights:

• Total Posts in 28 Day Period: 16

• Post Engagements: 62

• Post Reach: 202
Facebook Audience Demographics

### Your Fans

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Your Followers</th>
<th>People Reached</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-17</td>
<td>0%</td>
<td>18%</td>
</tr>
<tr>
<td>18-24</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>25-34</td>
<td>16%</td>
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<tr>
<td>35-44</td>
<td>10%</td>
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<tr>
<td>46-54</td>
<td>9%</td>
<td></td>
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<tr>
<td>55+</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>66+</td>
<td>3%</td>
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</tbody>
</table>

Women: 45%

Men: 54%

The people who follow your Page. This number is an estimate.

### Your Followers

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>15-17</td>
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<td>35-44</td>
<td>10%</td>
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<tr>
<td>46-54</td>
<td>8%</td>
</tr>
<tr>
<td>55-64</td>
<td>9%</td>
</tr>
<tr>
<td>65+</td>
<td>2%</td>
</tr>
</tbody>
</table>

Women: 46%

Men: 53%

The number of people who had any content from your Page or about your Page enter their screen screen, grouped by age and gender. This number is an estimate.
Social Media Post Examples
Facebook and Instagram

Maryland Electric Vehicle
Published by Sharp & Company
Just now

Did you know that an EV could serve as a backup generator for your home? Forbes describes how current and future EVs could help solve a myriad of power issues that home owners and utilities currently face.

#MarylandEV #EV
https://www.forbes.com/-/media/…a-not-a-problem-for-the-…

Maryland Electric Vehicle
Published by Sharp & Company
Just now

Looking for a place to charge your EV when away from home? Part of Maryland's Zero Emission's Electric Vehicle Infrastructure Council (ZE'Brien) responsibilities are to promote statewide charging infrastructure. When traveling with your EV, rest assured that there are 708 stations and 2,166 charging outlets in MD to choose from.

http://www.mdot.maryland.gov/…/About_the_Council.html
Visit the National repository of EV Station Information to find one near your home, work, or travel destination. #MarylandEV #EVRoadTrip
https://afdc.energy.gov/stations/#/FindNearest

Maryland Electric Vehicle
Published by Sharp & Company
Just now

Intelligent Transport Systems (ITS) Centre notes a new study from Northwestern University which finds that widespread US adoption of electric vehicles could save approximately $17 billion annually by avoiding damages from climate change and air pollution. Start driving an EV and become a part of the change.

#MarylandEV #EV

Maryland Electric Vehicle
August 31 at 12:10 PM

Widespread EV adoption could save U.S. $70 billion annually, study finds

76 People Reached
7 Engagements

Intelligent Transport Systems (ITS) Centre notes a new study from Northwestern University which finds that widespread US adoption of electric vehicles could save approximately $17 billion annually by avoiding damages from climate change and air pollution. Start driving an EV and become a part of the change.

#MarylandEV #EV

Time for a change
Carbon dioxide emissions, percent change, 2005–2017

EVs Are Not A Problem For The Electric Grid, They Are The Solution

MCDOT, Maryland Department of Transportation
National Drive Electric Week Events

• Annapolis Virtual Showcase – October 1
• Annapolis Recovery Zone Exhibition – October 2
• EVADC Virtual Event – October 4

• Additional National events are available at www.driveelectricweek.org
State Agency Updates
Local Outreach – ZEV Webinars

Western region: Tuesday, October 6
Eastern Shore: Wednesday, October 7
Central region: Thursday, October 8
2019-2020 Existing Priorities

• Maximize the use of grant and alternative funding opportunities for EV and EVSE in Maryland.
• Develop an approach to address the Right to Charge and EV Parking/Anti-Icing.
• Ensure EV readiness through strategic infrastructure planning that focuses on corridors, workplaces, and communities.
• Continue education and outreach coordination with a focus on diversity and equity.
Utilities Updates
Closing Remarks – Deputy Secretary Lewis

- Next Meeting November 2020