

**From:** [Coello, Catherine](#)  
**To:** [MCP-Chair](#)  
**Subject:** FW: 2050 Vision  
**Date:** Tuesday, November 10, 2020 12:43:19 PM  
**Attachments:** Hydrogen Fuel Cell presentation

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**From:** Afzal, Khalid <khalid.afzal@montgomeryplanning.org>  
**Sent:** Tuesday, November 10, 2020 12:13 PM  
**To:** Coello, Catherine <catherine.coello@mncppc-mc.org>  
**Cc:** Stern, Tanya <tanya.stern@montgomeryplanning.org>; Wright, Gwen <gwen.wright@montgomeryplanning.org>; McCarthy, Caroline <caroline.mccarthy@montgomeryplanning.org>; Broullire, Bridget <Bridget.Broullire@montgomeryplanning.org>; Hill, Maren <maren.hill@montgomeryplanning.org>  
**Subject:** FW: 2050 Vision

Hi Catherine,  
Please forward this email and the attached file to all PB members.  
Thanks  
Khalid



**Khalid Afzal**

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**From:** Romulo Huezo <[romuloh01@gmail.com](mailto:romuloh01@gmail.com)>  
**Sent:** Tuesday, November 10, 2020 6:54 AM  
**To:** MCP-Chair <[mcp-chair@mncppc-mc.org](mailto:mcp-chair@mncppc-mc.org)>; Afzal, Khalid <[khalid.afzal@montgomeryplanning.org](mailto:khalid.afzal@montgomeryplanning.org)>  
**Cc:** Romulo Huezo <[romuloh01@gmail.com](mailto:romuloh01@gmail.com)>  
**Subject:** Fwd: 2050 Vision

**[EXTERNAL EMAIL]** Exercise caution when opening attachments, clicking links, or responding.

Attachment available until Dec 10, 2020

Greetings,

I like to ask you to please forward this information to the Montgomery County Planning Board and for the Vision for 2050. Environmental issues are a priority around the world and some countries are taking leap steps to approach this issue different ways.

My vision is to leave a better world for our children, and we know for a fact that CO2 emissions is a contributing factor to the climate change. In fact, there is a world organization that is addressing this issue with technology and resources, the organization is The World Hydrogen Council, <https://hydrogencouncil.com/en/>, where they have a vision just like the Montgomery County for the year 2050.

Therefore, I like to share with the board the attached presentation(in PDF) so they are aware of the benefits and opportunities that this technology can offer to the Montgomery county, Maryland, and the USA. California is implementing a plan for the year 2050 as well, and they are on their way to achieve it.

Please make sure that the board members receive a copy of this presentation and I available for questions and to present the importance of this technology to the board members and how can they include in their planning the use of clean fuels technologies.

Thank you, and looking forward to hear form you.

Romulo Huezo

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# Hydrogen Fuel Cells Opportunities In Maryland.

*Romulo E Huevo*

# My History and Vision for the climate challenge.

1. I grew up in El Salvador, Central America, and moved to California in 1980, and now in Maryland since 2018; I had many dreams.
2. I have two beautiful boys.
3. I completed my Electronic Engineering Technology degree.
4. I completed my pilot license.
5. Worked for one of the best Semiconductor equipment companies in the world for +25 years.
6. In one of the chemical processes we did, we used hydrogen as a chemical carrier, learning about the hydrogen properties and safety.
7. Traveled around the world meeting great people and learning about the goods and challenges we have in the world.
8. Once I left the semiconductor industry I focused on renewable energy.
9. First in the Solar technology receiving a certificate from the Solar Institute in 2009, and after this...

10. Educating individuals and companies about the solar panels benefits and challenges we had in 2009.
11. Traveled in Central America promoting and attending conferences about the solar industry and debating challenges from the deniers.
12. Re-focused on the transportation industry in 2012.
13. Increased my knowledge about the use of hydrogen as an alternative fuel for the transportation industry.
14. Attended trainings, seminars, and conferences about applications of hydrogen in Fuel Cells for the transportation industry.
15. The best approach to bring hydrogen to parity with fossil fuels is to focus on the heavy transportation applications to create demand.
16. Attended and received Climate Reality Leadership certificate in August 2020.
17. Now, my vision is to educate and proliferate the Climate Reality objective to reduce global warming below the 1.5°.



# Why Hydrogen?

"Hydrogen is today enjoying unprecedented momentum. The world should not miss this unique chance to make hydrogen an important part of our clean and secure energy future ."

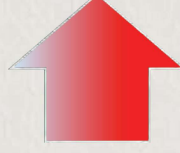
Fatih Birol, Executive Director, IEA

## Hydrogen can be used much more widely.

There have been false starts for hydrogen in the past;

*this time could be different. The recent successes of solar PV, wind, batteries and electric vehicles have shown that policy and technology innovation have the power to build global clean energy industries. California and Europe are proving this.*

Solar PV module prices have fallen by around 90% since the end of 2009.



At the end of 2018, module prices in Europe ranged from **USD 0.22/W** for “low cost” modules to **USD 0.42/W** for “all black” modules. Benchmark solar PV module prices fell rapidly between 2010 and 2013, but average module prices by country continued falling between 2013 and 2018, with declines between **34%** and **61%** for gigawatt-scale markets

Hydrogen can enable renewables to provide an even greater contribution. It has the potential to help with variable output from renewables, like solar photovoltaics (PV) and wind, whose availability is not always well matched with demand.

SOURCE: INTERNATIONAL ENERGY AGENCY (IEA)

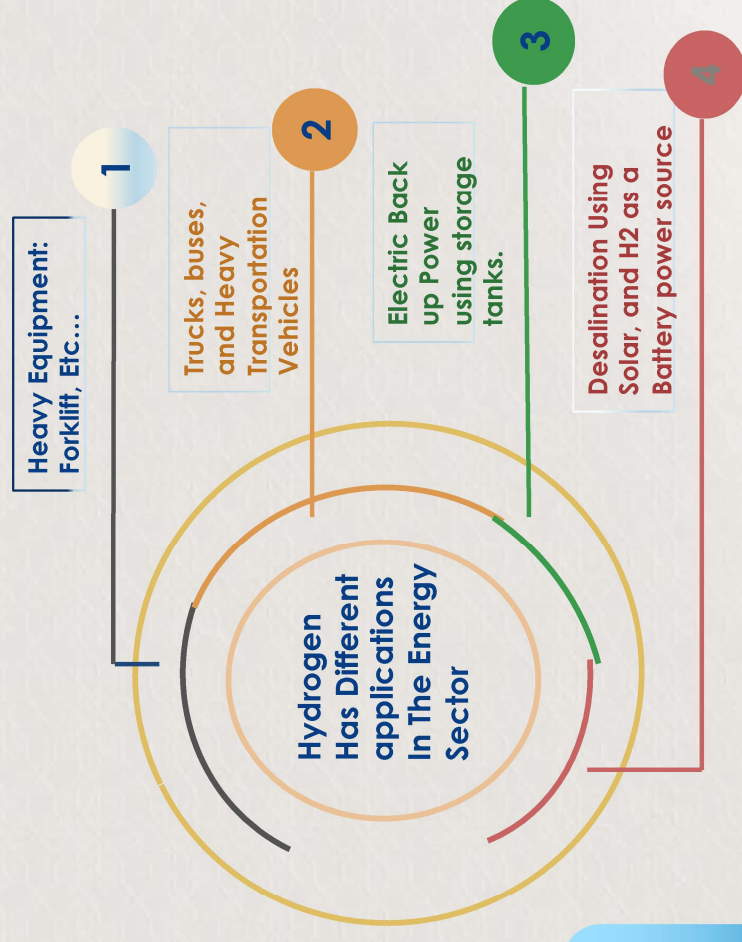
The time is right to tap into hydrogen's potential to play a key role in a clean, secure and affordable energy future.

Hydrogen can help tackle various critical energy challenges.

Hydrogen is versatile.

Technologies already available today enable hydrogen: ***to produce, store, move and use energy in different ways.***

*Hydrogen is one of the leading options for storing energy from renewables and looks promising to be a lowest-cost option for storing electricity over days, weeks or even months.*

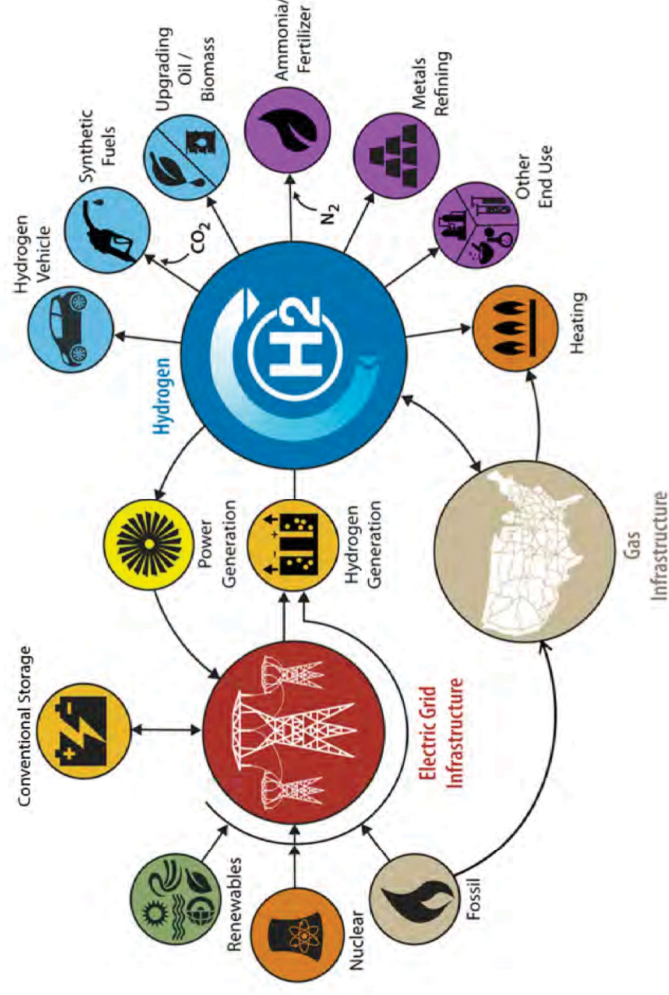




# Hydrogen As An Energy Carrier

*Hydrogen is not an energy source but an energy carrier, which means that its potential role has similarities with that of electricity.*

Different applications of Hydrogen



*The crucial difference between hydrogen and electricity is that hydrogen is a chemical energy carrier, composed of molecules and not only electrons.*



## The International Energy Agency (IEA) and the Future of Hydrogen

1. Hydrogen is already widely used; however, it has not yet realized its potential to support clean energy transitions **due to electricity cost**.
2. Greater attention to the deep **emissions reductions** that hydrogen can help deliver, especially in hard-to-abate sectors is being addressed.
3. Hydrogen is seen as able to contribute to a wider range of policy objectives.
4. Hydrogen can help ensure the **current rapid growth** of renewable electricity continues.
5. Hydrogen can benefit from positive experiences of **developing clean energy technologies**.

# Scaling Up Hydrogen

**Fuel Cell Vehicles are becoming more efficient and compatible with standard fossil fuel vehicles.**

**There are currently around 11,200 hydrogen-powered cars on the road worldwide. Existing government targets call for that number to increase dramatically to 2.5 million by 2030.**

6



## Light Duty Fuel Cell Vehicles



RENAULT ENTERS  
WITH NEW H<sub>2</sub> FUEL  
CELL DELIVERY VAN  
IN LATE 2019 AND  
EARLY 2020 AND  
OFFERS 3 TIMES  
MORE RANGE THAN  
AN ELECTRIC  
VEHICLES.

SOURCE: CaFCP



## Fuel Cell Heavy Vehicles

**HYUNDAI** has a contract to built 1600 NEW FUEL CELL TRUCKS IN SWITZERLAND with H<sub>2</sub>E.

*The new joint venture agreement states that Hyundai will supply a total of 1,600 fuel cell-powered heavy trucks to Hyundai Hydrogen Mobility from 2019 to 2025 – 600 more than originally announced in a memorandum of understanding signed in 2018 between H2E and Hyundai.*



Hyundai Swiss delivered Truck

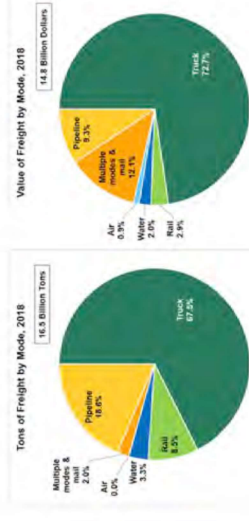
Vehicle Technology Office, DOE, Document FOTW #1150, September 7, 2020:  
In the USA Trucks Moved 68% of All Freight by Weight and 73% of Freight by Value in 2018



totalled 16.5 billion tons with a total value of \$14.8 billion.



NIKOLA TRUCK EUROPEAN VERSION



NIKOLA DESIGNED A CLASS 8 SEMI TRUCK READY FOR PRODUCTION IN 2021

Opportunities to Scale Up Hydrogen in the heavy transportation Industry  
Trucks, Buses, Trains, and Aviation is waiting for lawmakers to implement legislations to reduce CO<sub>2</sub> Emissions in their States and region!

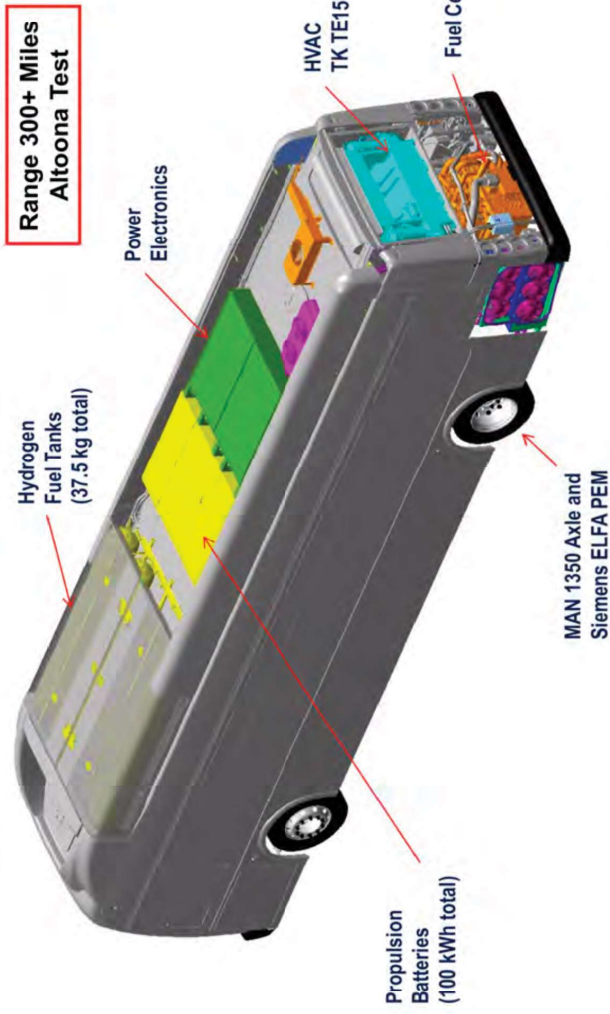


## Fuel Cell Heavy Vehicles, Buses

TRANSPORTATION AGENCIES ARE FOCUSING IN CLEAN MOBILITY AND NOT PURCHASING OR USING DIESEL BUSES BY 2030 IN CALIFORNIA AND OTHER STATES IN THE USA



Xcelsior XHE40 Fuel Cell Bus

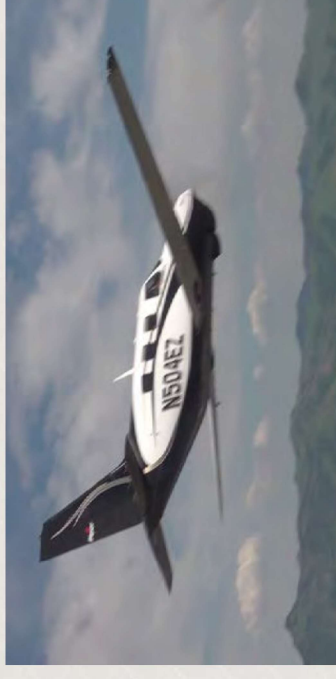




# Hydrogen Fuel Cell Experimental Aircraft Currently Flying In California

## Hydrogen Fuel Cell In Aviation

ZeroAvia developed a hydrogen fuel cells airplane



Expanding the use of clean hydrogen in other sectors – trucks, steel and heating buildings – is another important challenge. In Fact, The aviation industry is taking the challenge to design an airplane to carry from 20 to 30 passengers.

# Commercial Aviation Is Preparing to Scale Up Hydrogen As An Alternative Fuel.

September 21, 2020



AirbusZEROe Blended Wing Body Concept



## Introducing Airbus ZEROe

| Turbofan                                                                        | Blended-Wing Body                                                               | Turbofan                                                                        |
|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
|                                                                                 |                                                                                 |                                                                                 |
| <b>&lt;100</b><br>Passengers<br>Hydrogen<br>Engines (x 4)                       | <b>&lt;200</b><br>Passengers<br>Hydrogen<br>Engines (x 2)                       | <b>&lt;200</b><br>Passengers<br>Hydrogen<br>Engines (x 2)                       |
| <b>1,000+nm</b><br>Range<br>Liquid Hydrogen<br>Storage & Distribution<br>System | <b>2,000+nm</b><br>Range<br>Liquid Hydrogen<br>Storage & Distribution<br>System | <b>2,000+nm</b><br>Range<br>Liquid Hydrogen<br>Storage & Distribution<br>System |

**AIRBUS**



AirbusZEROe Turbofan Concept



AirbusZEROe Turboprop Concept

<https://www.airbus.com/newsroom/press-releases/en/2020/09/airbus-reveals-new-zeroemission-concept-aircraft.html>



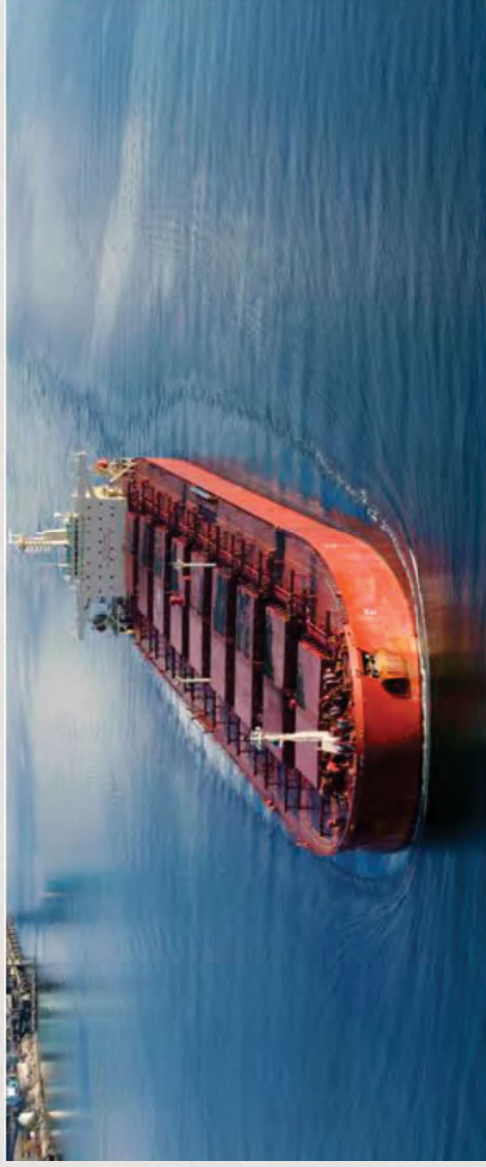
## Fuel Cell Maritime Transportation

In 2016, IMO **adopted** mandatory requirements for ships of **5,000 gross tonnage and above** will have to collect consumption data for each type of fuel oil they use, as well as other, additional, specified data including proxies for transport work. These ships account for approximately **85% of CO<sub>2</sub> emissions** from international shipping.

Japanese tug operator Tokyo Kisen



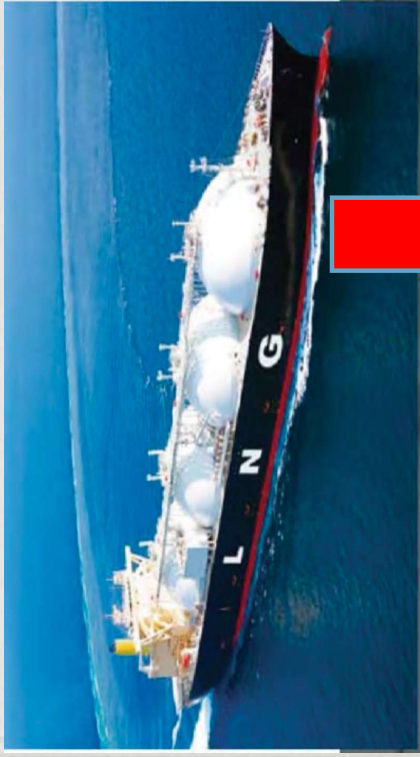
Hydrogen-powered tug planned for Japanese ports



Source: International maritime Organization



## Kawasaki Pilot liquefied hydrogen carrier



From LNG to LH<sub>2</sub>



Nearly 40 years have passed since Japan's first LNG carrier was built. Kawasaki has been making steady progress in building a world's first liquefied hydrogen(LH<sub>2</sub>) carrier. *The pressurized cryogenic cargo containment system specifically for LH<sub>2</sub> was developed successfully based on Kawasaki's existing technologies of LNG carrier building and of LH<sub>2</sub> land transportation and storage.*

Currently, the LH<sub>2</sub> carrier is designed and under construction based on the safety requirements approved by the IMO\* as interim recommendations. LH<sub>2</sub> needs to be maintained at a temperature 91° C below that of LNG and easily evaporates.

Kawasaki will continue making further progress toward mass marine transportation of LH<sub>2</sub>.

\*IMO: International Maritime Organization

## Ballard Receives PO From Anglo American for 900kW of Fuel Cell Modules to Support Mining Truck Demonstration Project

The Mining Company is retrofitting evaluating an Ultra-Class Heavy Duty truck, with a 800kW Fuel Cell.

A car uses between **50kW** to **125 kW** Fuel Cell.



An Ultra-class heavy duty mining truck will be retrofitted with 800kW of Ballard fuel cell modules for a planned demonstration project in 2020

SOURCE: [www.ballard.com](http://www.ballard.com).



"Hydrogen is today enjoying unprecedented momentum. The world should not miss this unique chance to make hydrogen an important part of our clean and secure energy future."

Fatih Birol, Executive Director, IEA

**Why Do We Need To Act Now?**