



Hydrogen Deployment in California

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RE+ Events

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Smart Electric
Power Alliance

To be clear...

- I am not an engineer, scientist or researcher
- Electric vehicles come in two flavors: battery and fuel cell
- We need all the tools in decarbonization toolbox



North American West Coast

California, Oregon, Washington and British Columbia

- Increasingly aligning and identical policies for zero-emission vehicles and hydrogen economy
 - Pacific Coast Collaborative
- Statement of Cooperation (October 6)
 - Accelerate charging and hydrogen fueling
 - Focus on I-5 corridor – San Diego to Vancouver
- Hydrogen hub efforts
 - CA – Alliance for Renewable Clean Hydrogen Energy Systems (ARCH2ES)
 - WA and OR – Pacific Northwest Hydrogen Association
 - BC - Hydrogen Changemakers Consortium – CICE

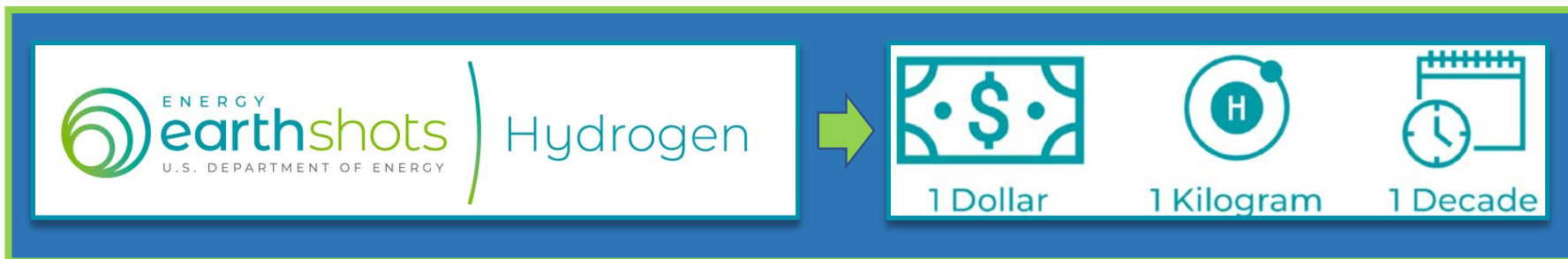


Federal drivers of renewable and low-carbon hydrogen

- Infrastructure Investment and Jobs Act (2021)*
 - Clean hydrogen production – \$9.5 billion:
 - **Hydrogen hubs** - \$8 billion
 - Decrease cost of producing hydrogen with electrolyzers - \$1 billion
 - Clean hydrogen manufacturing and recycling - \$0.5 billion
- Inflation Reduction Act (2022)
 - Hydrogen Production Tax Credit – 45V
- \$1 billion demand-side program announced (2023)

79 hub applicants
33 encouraged
7 selected

Western U.S. Hubs



CALIFORNIA AWARDED UP TO **\$1.2 BILLION** TO CREATE A RENEWABLE **HYDROGEN HUB**



“This federal funding will help launch a hydrogen hub here in Southern California and will greatly help accelerate LA’s conversion to clean, critical generation right here in the LA basin.

This is a win for the environment and for LADWP’s power customers who want and need an affordable path to a clean energy future.”

– *Martin Adams, General Manager and Chief Engineer, Los Angeles Department of Water and Power*

Hydrogen mobility



Cars



Toyota Mirai 2021



Toyota Mirai 2016

Hyundai
NEXO



BMW
iX5
Hydrogen



Clarity 2016
Honda
CR-V 2024



Rolls-Royce considering hydrogen power for future EV models

Torsten Müller-Ötvös says firm "might exit batteries" but rules out hydrogen combustion



 Hype
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📣 Première mondiale : les chauffeurs salariés Hype ont assuré les déplacements d'une partie ...see more



APF France handicap et Hype unissent leurs forces pour déployer des services de taxis Crit'Air 0...

Vroom H2!



Hyundai N Vision 74 Concept



Hyperion XP-1



Toyota Corolla Racing Car



Gaussin Racing Truck



Toyota GR Hydrogen Racing Concept



Hopium Machina

Red Bull makes hydrogen fuel cell play with AVL

News

Red Bull Advanced Technologies is partnering with Austrian mobility specialists AVL to develop lightweight fuel cells for motorsport, aviation and performance cars.



2/3

lighter fuel cell stack

Transit buses

Canaries in the coal mine



Why Santa Cruz County Is So Bullish on Hydrogen Buses

43

agencies pursuing H2
in their fleet mix

Trucks



PACCAR MENU

PACCAR and Toyota Expand Hydrogen Fuel Cell Truck Collaboration to Include Commercialization

Fuel cell electric truck manufacturers (partial list)

- cellcentric
- Cummins
- Daimler Truck North America
- Hino/Toyota
- Hyundai
- Hyzon
- Nikola Motor
- Paccar/Kenworth
- Quantron



Dan Ronan | Senior Reporter
April 5, 2023 2:55 PM, EDT

NACFE Says Trucking's Future Is With Hydrogen

Group Notes It's Best Option to Reach Long-Term Goals



02/16/2023

BP to Acquire TravelCenters of America for \$1.3B

TA's 281 highway locations will complement BP's off-highway convenience and mobility business.



Refuse trucks

- / Up to **125 miles** and **1,200 collecting cycles**
- / **360 kW** / **482 hp peak**
- / **15 minute** refueling time



Trains



MASS TRANSIT

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APTA EXPO 2023 COVID-19 NEWS BUS RAIL TECHNOLOGY SAFETY & SECURITY ALT. MOBILITY MANAGEMENT TRANSIT BIDS

RAIL > VEHICLES

Stadler's FLIRT H2 train achieves Guinness World Records title

The hydrogen powered train was able to travel 1,741.7 miles on one tank in 46 hours.



Caltrans signs historic, \$80 million contract with Stadler Rail

Base order of four trains, with possibility of 25 additional trainsets.

Maritime



Office of Energy Efficiency & Renewable Energy

U.S. Department of Energy Leads International and Domestic Efforts for Zero-Emissions Shipping by 2050

Resources: Learn more

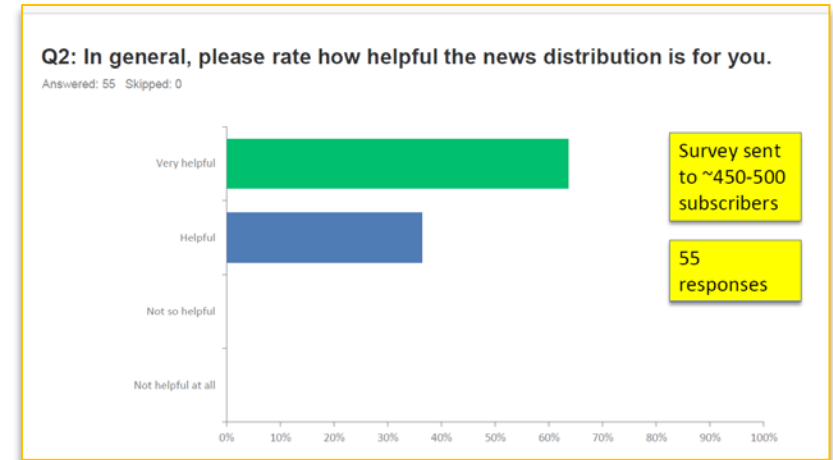
- Fuel cells, DOE - <https://www.energy.gov/eere/fuelcells/fuel-cells>
- NASA - <https://www.nasa.gov/content/space-applications-of-hydrogen-and-fuel-cells>
- Hydrogen – <https://www.eia.gov/energyexplained/hydrogen/>
- Hydrogen Fuel Cell Partnership - <https://h2fcp.org/>
- H2 Tools, Center for Hydrogen Safety - <https://h2tools.org/>
- Hydrogen Safety Project - <https://safehydrogenproject.org/>



Happy to add you to the news distribution.

Reader survey

- 60% found it very helpful; 40% helpful
- Nearly 60% would recommend
- 20% forward very often; 40% often



Questions? Follow up?

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