



www.colorado-hydrogen.org

Monthly Meeting
21 May 2024

Agenda

- Emerson presentation
- Fuel station deployment status
- BNG Clean Fuel presentation
- CSU considering hosting student hydrogen car racing in Colorado
 - Racing sponsorship
- CHN website overhaul

Emerson – Summit in Boulder June 13th



EMERSON



Brad Healey
SALES DIRECTOR



**The Future of Hydrogen -
Fueling Sustainable Energy in Colorado**

Summit – June 13, 1:00 to 4:00 in Boulder

Colorado Hydrogen Fuel Stations

- CSU and New Day Hydrogen (NDH) were awarded a \$9M grant for three hydrogen fuel stations
 - Charging and Fueling Infrastructure (CFI) Grant
 - Link: www.fhwa.dot.gov/environment/cfi/grant_recipients/
 - Ft. Collins, Denver & Pueblo, Associated with the 3 CSU campuses
 - Press release: tinyurl.com/CFIpress
- CSU & NDH are conducting **public information meetings**
 - Ft. Collins and Pueblo have already occurred
 - Denver meeting scheduled
 - Wednesday June 5, 1:00 to 4:00 Mountain Time
 - Location:
CSU Spur Campus
Vida Building
4777 National Western Drive
Black Bear Classroom.

Denver Public H2 Info Meeting Agenda (June 5th)

- General overview of CFI Project and DOT CFI Grant Award
 - Discussion of workforce development
- Discussion of DOE VTO Grant Submittal
- Panel discussion on operating hydrogen trucks in Colorado
 - Moderator – Hunter Woodruff of Drive Clean Colorado
 - Roy Hensler – Rising Creek Transportation
- Hydrogen 101 Discussion
 - Audience Q&A
- Nikola TRE Truck on display
 - Rising Creek Transportation Operating now in Colorado.



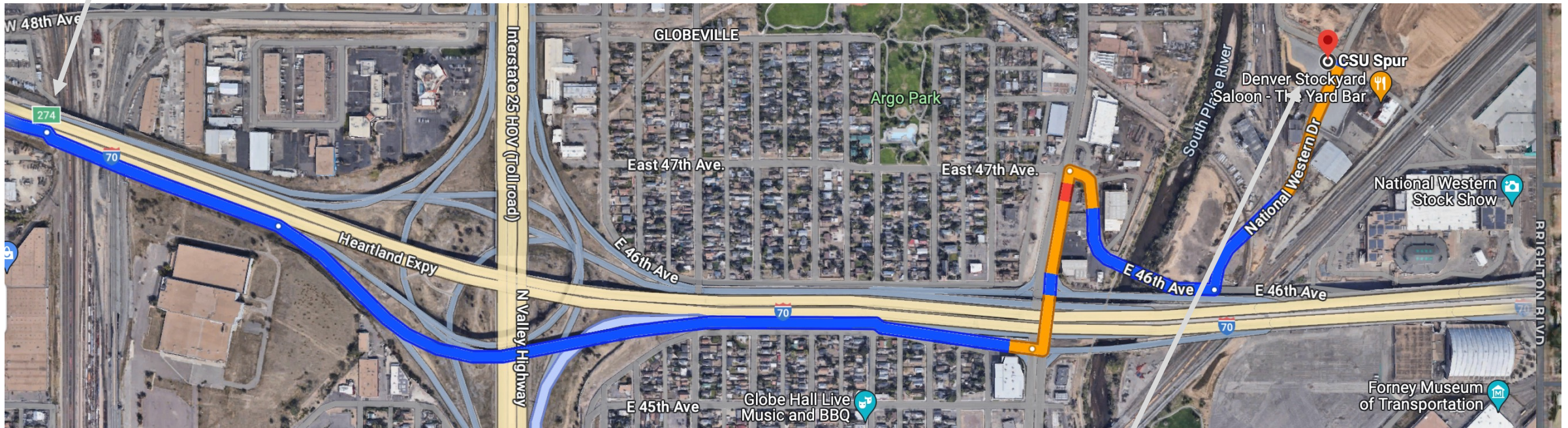
CSU Spur From I-25

Caution!
From I-70 EB
Washington St. Exit 274 is WEST of I-25



CSU Spur From EB I-70

Take Exit 274 for Washington St. North



Caution!

Satellite Map View
in Google Maps and Apple Maps is out of date
And **Does NOT** show CSU buildings

BNG Clean Fuel



Eliot Barton

FOUNDER AND CHIEF EXECUTIVE OFFICER



H2 Fuel for a Cleaner World

BNG Clean Fuel Corporation is a clean energy infrastructure start-up focused on the storage, delivery, and dispensing of hydrogen fuel to trucking fleets and independent operators that are undergoing a transition from high-emission diesel-powered trucks to zero-emission hydrogen-powered trucks.

Horizon Educational

- Founded in 2003 to bring miniature fuel cells to schools and students

- Hardware kits & curriculum



- In 2015, Horizon launched the *H2 Gran Prix* series of races

- Greater engagement of students through competition
 - Students learn to design, test and redesign
 - Races are international
 - 2,500+ teams, 20,000+ students, 20+ countries

- In 2023 Horizon launched the non-profit H2GP Foundation

- To promote and sponsor the H2 Gran Prix races
 - Donations tax deductible



www.H2GP.org





Pro

- Ages 14 to 19
- Design, build and race 1:10 scale radio-controlled hydrogen-powered cars
- Race competes for first to finish on a serpentine track



Sprint

- Ages 10 to 16
- 1:20 scale SPRINT car
- Students experiment with 3D design – updating the gear-to-wheel ratio, car weight distribution, or even designing the entire chassis with digital modelling software
- Race competes for speed over 10 meters



Explorer

- Ages 6 to 10
- Design & build fuel cell car
- Race competes for distance



Student Racing is Coming to Colorado

- CSU is considering sponsoring student racing
 - Host the track and venue for Colorado racing
 - Enlist schools and students
- We need your help finding points of contact
 - Identify Schools
 - Recommend teachers or principals that we can contact (provide e-mail)
 - If you have a school in mind, but don't have a PoC, let us know anyway
 - Identify sponsors (tax deductible)
 - Individual and corporate sponsors
 - Sponsor a team – \$6K (1 car, 5 students)
 - Need \$11K to acquire track & carpet (one time expense)
 - Sponsors Will Receive Promotional Recognition

Please contact brian.debruine@gmail.com with Points of Contact



Our First Racing Sponsor: Spark



www.sparkionx.com

Sean Daniel
CEO and Founder

High-durability Anion Exchange
Membranes with performance and
durability rivaling Proton Exchange
Membranes

CHN Website Overhaul

Home Page



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Photos courtesy of NREL

Working
to Deploy
Hydrogen
Technology

Coming Events

Link to calendar

The Colorado Hydrogen Network Now has a YouTube channel!

We're now posting recordings of the CHN Monthly Meetings plus something new -- special video episodes of the HydrogenNowCast. Check it out by clicking the YouTube logo:



Link to YouTube Channel



YouTube Channel

The screenshot shows the YouTube channel for the Colorado Hydrogen Network. The channel banner features the logo and a snowy mountain landscape. The profile picture is a portrait of an older man. The channel description states it is a non-profit advocacy organization. The video list includes monthly meetings and a video podcast.

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OLORADO HYDROGEN NETWORK

Colorado Hydrogen Network

@ColoradoHydrogenNetwork · 8 subscribers · 8 videos

The Colorado Hydrogen Network is a non-profit advocacy organization devoted to encour...more

colorado-hydrogen.org and 2 more links

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CHN Mtg Aug 2023
25 views · 2 weeks ago

CHN Mtg October 2023
8 views · 2 weeks ago

HydrogenNowCast Vid 1
15 views · 2 weeks ago

CHN Meeting November 2023
No views · 3 weeks ago

NEW
Video Podcasts

Recordings of
Monthly Meetings



Calendar Page

NEW



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Calendar and Upcoming Events



11-12 JUNE 2024

RONALD REAGAN INT. TRADE CENTER, WASHINGTON D.C.

CONNECTING THE WORLD'S SENIOR
HYDROGEN LEADERS WITH THE AMERICAS

[REGISTER YOUR PLACE](#)

The discount code for CHN Stakeholders to register for the summit is: CHN15HAS



The Colorado Hydrogen Network Monthly Meetings are the third Tuesday of the month, 3:30 to 5:00 PM Mountain Time, on-line only, the link changes monthly. All are welcome. See this month's newsletter for the link to the meeting or request the link [here](#).



JUNE 4, 2024

SPOKANE, WA

renewableh2.org/conference



Initiatives Page

Initiatives



Hydrogen Transportation System – The Colorado Hydrogen Network is helping to drive forward hydrogen for transportation by supporting the establishment of suppliers for the Fuel, Fleets for the vehicles and government grants and incentives plus investors for the Funding. Together Fuel, Fleets, and Funding form the “Three F’s” of a hydrogen transportation system.



HydrogenNowCast podcast – With over 80 episodes released, the HydrogenNowCast helps listeners achieve an integrated understanding hydrogen and other energy forms and learn about up-and-coming technology and companies.



Hydrogen Electric Generators – Hydrogen can be used as a fuel for turbines, from small distributed-scale to utility scale, as well as a fuel internal combustion engines. These engines can then be used to power electrical generators for on-grid and off-grid applications. CHN is work to bring technology advice to users, and help locating infrastructure and high-volume low-cost hydrogen such as geological hydrogen.



Education, Advocacy and Public Awareness – CHN produces both monthly on-line meetings and a newsletter to provide education and networking opportunities to the stakeholders. Director Brian DeBruine is a frequent speaker at webinars and seminars. CHN works closely with the Colorado Energy Office and the Colorado Department of Transportation to advocate for hydrogen. CHN also is engaged with the universities to establish workforce training as well as the grade school and high school levels for STEM training as well as the [H2GP Educational Foundation](#).



Geological Hydrogen – Clean hydrogen can be obtained from the ground in two ways – either naturally occurring hydrogen tapped with simple wells or hydrogen generated in old petroleum wells. In this last case, oxygen is injected into petroleum reservoirs which combines with water and hydrocarbons releasing hydrogen. Only pure hydrogen is brought to the surface through a palladium filter. Since all the hydrocarbons stay underground, there are no methane leaks or carbon to sequester. In fact, these wells can sequester 3 times the CO₂ as the hydrogen produced. CHN is working to promote both of these technologies by engaging with suppliers and users such as utilities and anyone needing large quantities of low-cost hydrogen.

Updated Topics, Icons
and Descriptions



H2 Fuel Stations Page



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[H2 Fuel Stations](#)

Colorado Hydrogen Transportation Timeline

January 2017 - [Retail Hydrogen Fueling Regulations](#) established by CDLE Office of Oil & Public Safety

September 2019 - Colorado passes the [Zero-Emission Vehicle \(ZEV\) Rule](#)

December 2019 - Non-profit Colorado Hydrogen Network (CHN) is formed

July 2020 - Colorado signs Multi-State [MD/HD Zero Emission Vehicle MOU](#)

September 2020 - Colorado State University (CSU) takes delivery of a [modular hydrogen fuel station](#) through the efforts of CHN and NREL

December 2020 - [New Day Hydrogen](#) is formed to deploy hydrogen fuel stations

October 2021 - The Colorado Energy Office releases a [Hydrogen Roadmap](#)
Mid-2021 - Colorado passes [SB21-260 "Sustainability of The Transportation System"](#) to generate new sources of funding for ZEV's & infrastructure and create a "[Clean Fleet Enterprise](#)" (CDPHE) and "[Clean Transit Enterprise](#)" (CDOT) to help fund Zero Emission Vehicles. The "[Community Access Enterprise](#)" (CEO) is formed to help fund charging and fueling infrastructure.



NEW DAY
HYDROGEN

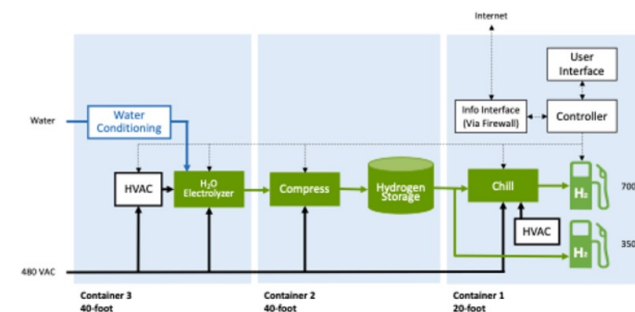
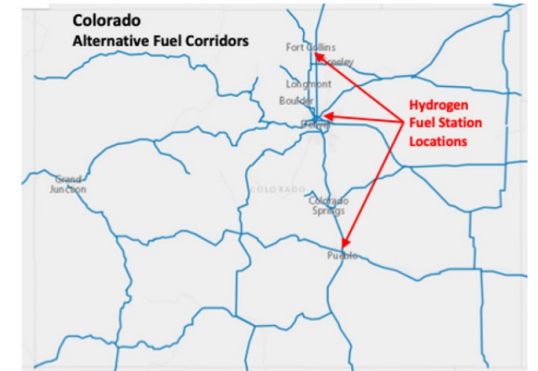


CFI Grant Summary

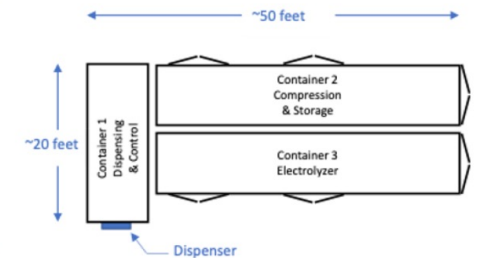


Charging and Fueling Infrastructure Grant

- \$11M (\$9M Grant + \$2.2M match)
- Three Hydrogen fuel stations
 - Ft. Collins – CSU Powerhouse
 - Denver – Near I-70 & I-25 intersection
 - Pueblo – Location TBD
 - Open to the public
- Workforce training
- Enlisting medium-duty vehicle fleet users
- Leverage Colorado "Enterprise" funding for vehicle & infrastructure support, and [Clean Hydrogen Tax Credit](#)



Modular Fuel Station Block Diagram



Modular Fuel Station Footprint
210 kg per day

Colorado Hydrogen Timeline With Links to Sources



Resources Page

Tech Briefs



[Hydrogen Wells](#)

This paper provides an overview of Natural or Geological Hydrogen.



[Tech Brief - Understanding EV's](#)

This tech brief provides a tutorial on Battery EV's Fuel Cell EV's and the differences, which highlights the use-cases for both vehicle types.



[Tech Brief - Transporting Hydrogen](#)

This tech brief provides an overview of new, alternative modes of storing and transporting hydrogen including Liquid Organic Hydrogen Carriers and Metal Hydrides.



[Tech Brief - Sources of Hydrogen](#)

This tech brief provides an overview of the sources of hydrogen including Geological Hydrogen Wells and extracting zero-carbon hydrogen from old petroleum wells.



[Tech Brief - Is Hydrogen Safe?](#) This tech brief explains hydrogen safety compared to gasoline and diesel



[Tech Brief - Does Making Hydrogen Use Much Water?](#) - No. See the comparison between a fuel station and a restaurant and a comparison with making gasoline



[Tech Brief - Why Do We Need Hydrogen?](#)

This tech brief answers common criticisms of hydrogen's role in the environmental movement to stop climate change, and shows how hydrogen is a critically needed component to support renewable electricity as a replacement for fossil fuels in all use cases.



[Tech Brief - Which Energy Form to Use?](#) To replace the functions that fossil fuels provide, which Clean energy source is right for each purpose?



[Tech Brief - Colors of Hydrogen.](#) This is a figure which shows that only four colors are needed to describe whether a source of hydrogen emits carbon or not, or is from a renewable source or not. These are the only criteria that are needed to determine the environmental impact of a hydrogen source.

Tech Briefs Have Been Updated and Expanded, New Icons



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Colorado Zero Emission Transportation Support

Getting any new market or technology off the ground often requires help and support until it reaches economies of scale to compete with incumbent technology. This was true of wind and solar and it's certainly true for battery and hydrogen electric transportation – both vehicles and infrastructure.

The State of Colorado recognizes this and has created a number of incentive programs to help foster the nascent battery and hydrogen transportation sectors.

The Colorado Energy Office has compiled a list and short description of some of this assistance in the [Clean Transportation Resources Factsheet](#).

ZEV Rule

In 2021 Colorado adopted the [Zero Emission Vehicle \(ZEV\) Rule](#). This Rule helps foster the Zero Emission Vehicle market by requiring automakers to make a certain percentage of their vehicle sales Zero Emission Vehicles.

Starting with model year 2023 (which starts on January 1, 2022), automakers must make a minimum percentage of Zero Emission Vehicles available for sale as part of their light-duty vehicle offerings in Colorado.

Starting with model year 2027 automakers must make a minimum percentage of ZEVs available for sale as part of their heavy-duty vehicle offerings in Colorado as well.

These requirements for manufacturers will help advance battery and hydrogen electric vehicle sales in Colorado, and help the State meet its Greenhouse Gas reduction goals.

Funding

To help bridge the temporary gap between electric and petroleum vehicle and infrastructure prices, Colorado [SB21-260](#) has created three new sources of dedicated transportation funding and new state Enterprises to enable a sustainable transportation system.

The [Clean Transit Enterprise](#) housed within the Colorado Department of Transportation (CDOT), the [Clean Fleet Enterprise](#) housed within the Colorado Department of Public Health and Environment (CDPHE), and the [Community Access Enterprise](#) housed within the Colorado Energy Office (CEO).

Stimulating Investment

The [Advanced Industry Investment Tax Credit](#) helps motivate clean energy investment in Colorado. Investors can earn a tax credit of 25% of their investment up to a maximum \$100,000 credit on an investment of \$10,000 or more. If the advanced industries business is in a Colorado enterprise zone or rural county, investors can earn a state income tax credit of 35% of their investment.

Links to Incentives and Funding



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Hydrogen Fuel Stations



The mission of New Day Hydrogen is to develop the market for hydrogen for vehicles while at the same time developing, deploying and financing the hydrogen infrastructure to supply that market. <https://www.newdayhydrogen.com>



Millennium Reign Energy manufactures residential hydrogen fuel stations for use with consumer hydrogen fuel cell vehicles, forklifts, as well as other compatible hydrogen fueled machines and equipment. These hydrogen stations are also available for commercial use. <https://mreh2.com>



EPC was formed with the sole purpose of delivering best in class hydrogen systems related engineering, design, procurement, permitting, construction, operations, maintenance and consulting services. <http://www.epc4h2.com>



[Elektrikgreen](#) produces residential and commercial energy storage as hydrogen for emergency & portable power, commercial & industrial hydrogen production, microgrids & smart connected communities plus hydrogen fueling stations.



[BNGH2](#) is focused on the storage, delivery, and dispensing of hydrogen fuel to the trucking industry



Companies Added

Education



The H2GP Foundation has a mission to accelerate the transition to a sustainable energy future by providing educational programs that promote the adoption of renewable energy and hydrogen technologies. CHN Director Brian DeBruine is on the board of the H2GP Foundation.



**Link to
Horizon Educational**



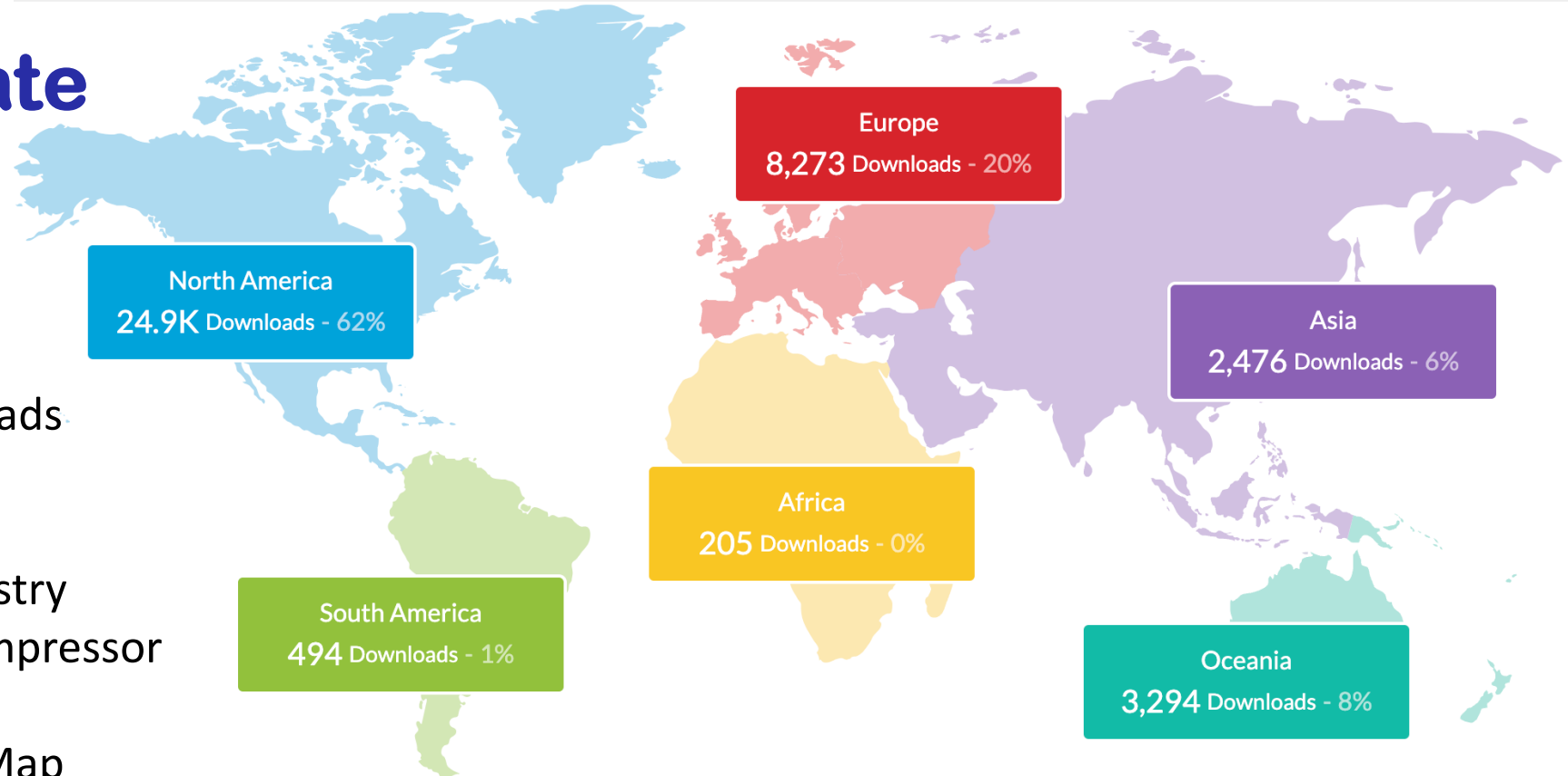
More Website Updates Coming

- More podcast transcripts
- Monthly meeting slides & recordings
- Monthly newsletters

Podcast Update

The *HydrogenNowCast*

- 85 episodes, 39,650 downloads
- Recent episodes
 - Plug Power
 - Path to Zero-Carbon Industry
 - HyET electrochemical compressor
 - Geological Hydrogen
 - Saoradh Hydrogen Data Map



HydrogenNowCast



Podcast



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