International Partnership
for Hydrogen and Fuel Cells
in the Economy

United States Update

Dr. Sunita Satyapal – IPHE Chair and U.S. Representative

30th IPHE Steering Committee Meeting

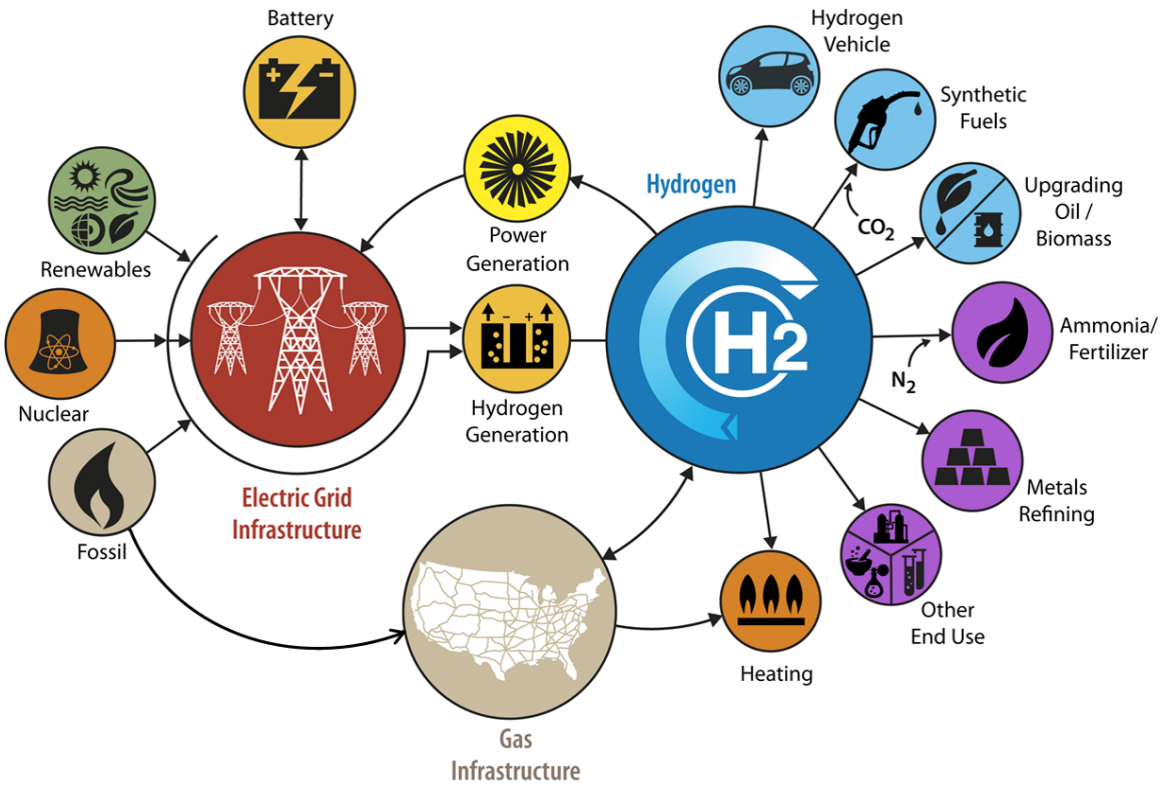
Pretoria, South Africa

6 December 2018

Vision and Strategy

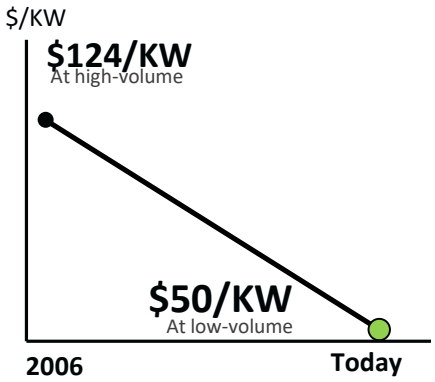
- Focus on R&D to advance H_2@Scale benefits including energy:
  - **Affordability**
  - **Security**
  - **Resilience**
  - **Flexibility**
- Increased commitment at the region/state level for H_2 infrastructure:
  - CA goal: **1,000,000 fuel cell cars and 1,000 H_2 stations by 2030**

H_2@Scale Vision: Affordable, reliable, clean, and secure energy across sectors



U.S. Dept. of Energy Activities and Impact

Early Stage R&D



60% Lower Fuel Cell Cost

H_2 Infrastructure

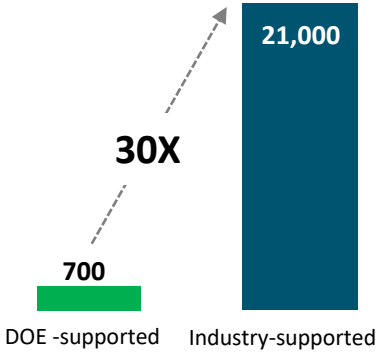
Washington D.C. H_2 Station

Tri-Gen H_2 Station

Other

- HySTEP
- Mobile Fueler
- Tunnels
- Liquid Release
- Station footprints
- H-Prize

Hydrogen and Fuel Cell Applications

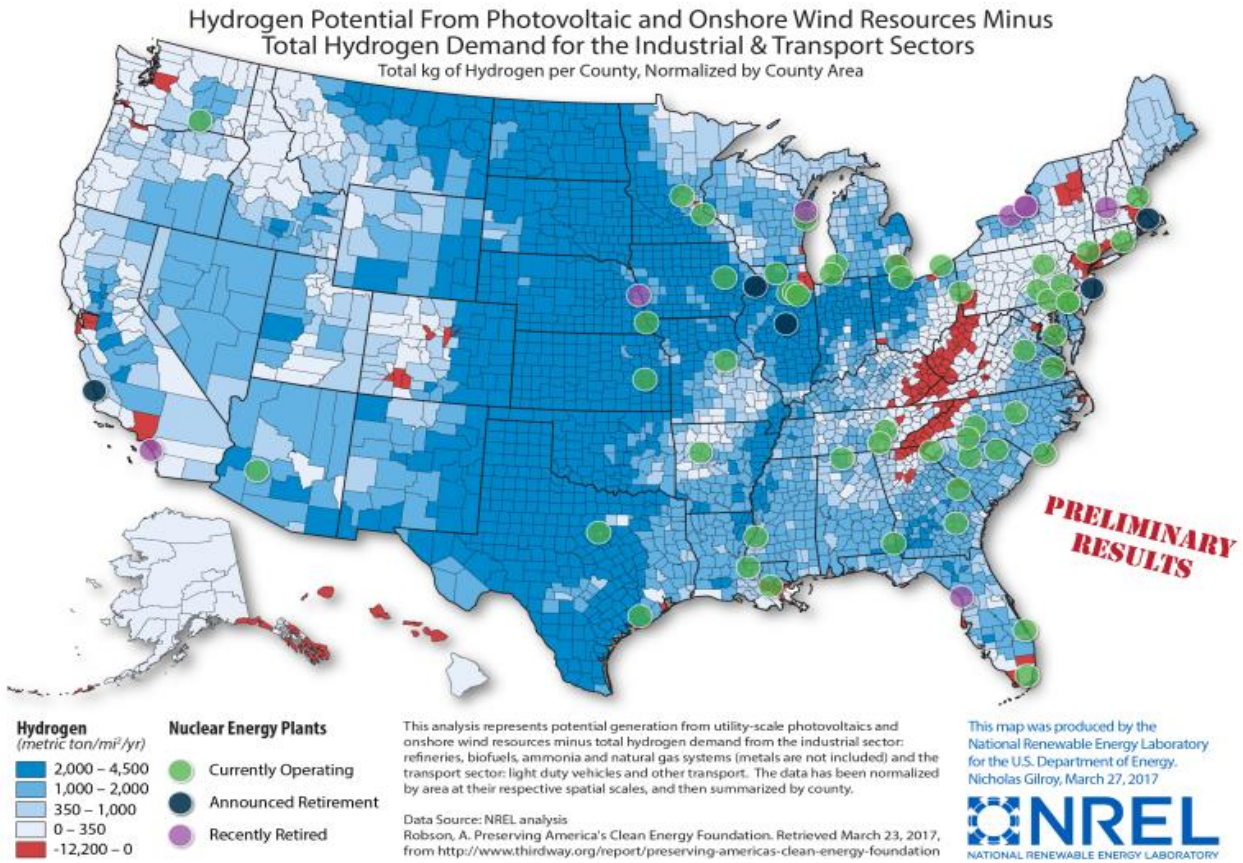


Lift Trucks

Parcel Delivery Vans

Ground Support Equip.

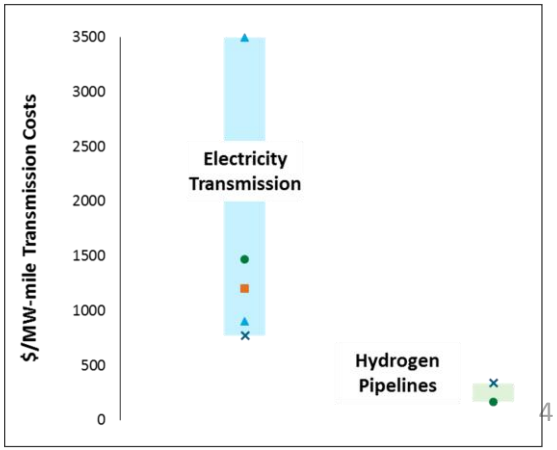
H_2@Scale: Nationwide Resource Assessment



Assessing resource availability. Most regions have sufficient resources.

Red: Only regions where projected industrial & transportation demand exceeds supply.

Assessing cost of H_2 vs electricity transmission (in process)



Hydrogen and Fuel Cell Applications Status

U.S. Snapshot

Over
>240MW
Backup Power

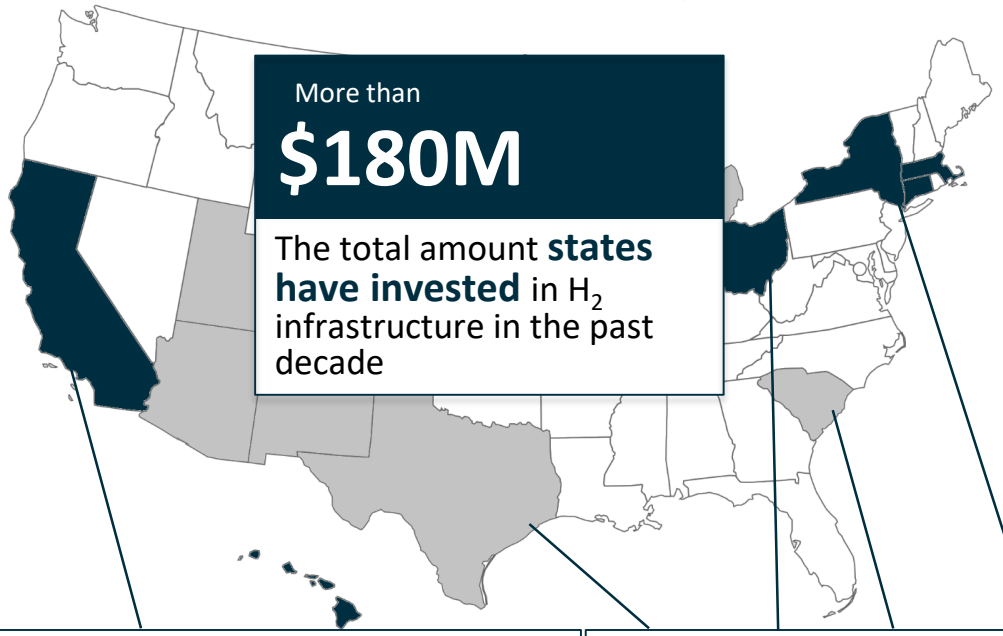
More than
23,000
Forklifts

More than
30
Fuel Cell Buses

36
H_2 Retail Stations

Nearly
5,800
Fuel Cell Cars

States with Growing Interest



CA

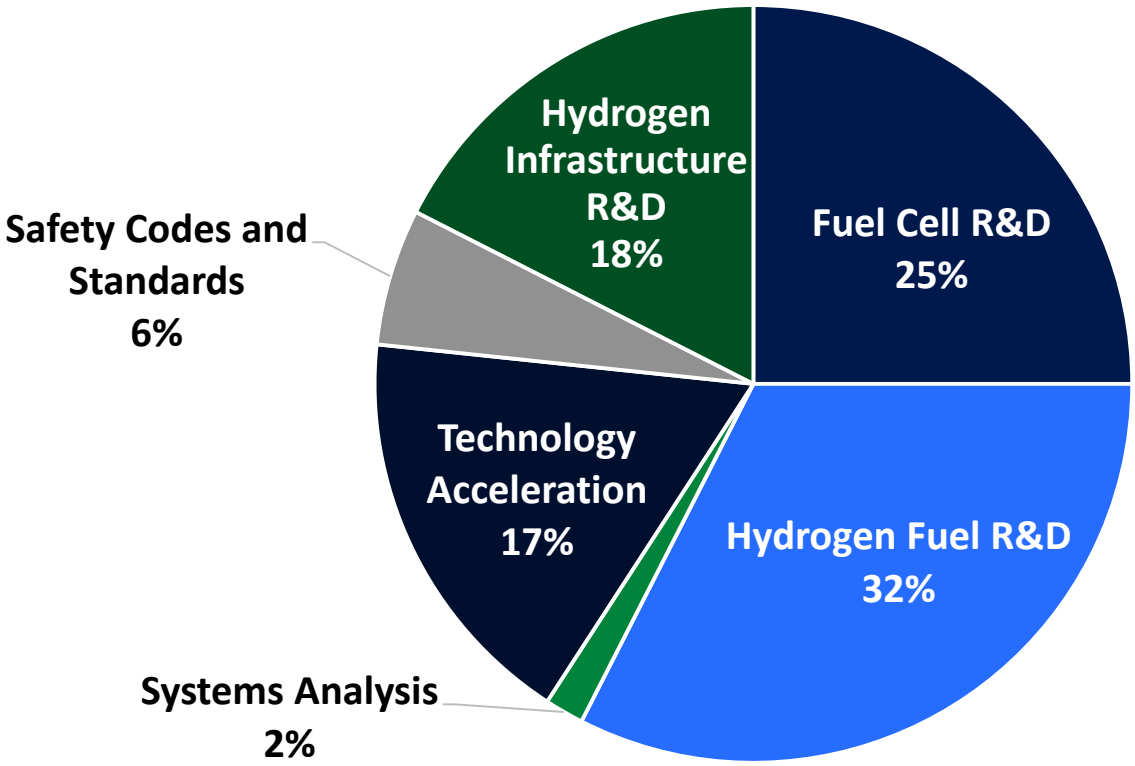
- 1,000 stations by 2030, 36 open
- $150M invested in H_2 infrastructure
- $235M announced in 2018 for electric vehicles
- $290 million for zero-emission vehicle and infrastructure technologies for use in bus, truck, freight, and marine applications.

HI, OH, SC, NY, CT, MA, CO, UT, TX, MI, and others with interest

- Over $27M invested
- 12-25 stations planned in the NE

Funding Updates

Total FY 2019 US Department of Energy Fuel Cell Technologies Office Funding: $120M



International Activities/Collaboration Updates

The U.S. Deputy Secretary of U.S. Dept. of Energy attended the Hydrogen Ministerial Meeting in Tokyo on Oct 23

Tokyo Statement
4 areas for collaboration

- **Harmonization of regulation**, codes and standards
- **Information sharing** on safety and infrastructure
- **Technical studies**
- **Communication, education and outreach**

Thank you

Dr. Sunita Satyapal – IPHE Chair Representative

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IPHE

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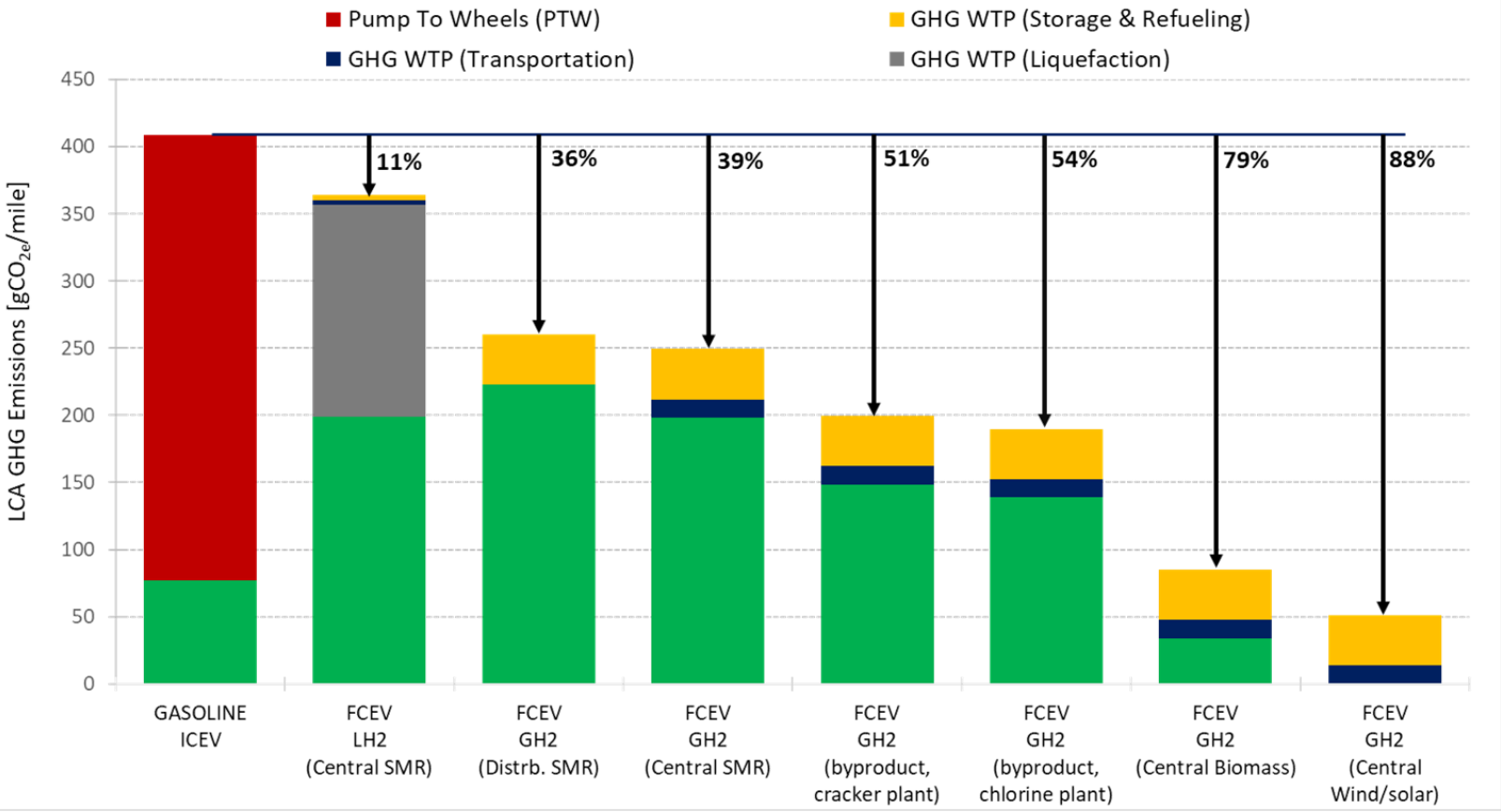
Upstream Hydrogen Production and Vehicle Efficiencies Must be Improved

R&D needed to improve liquefaction efficiency

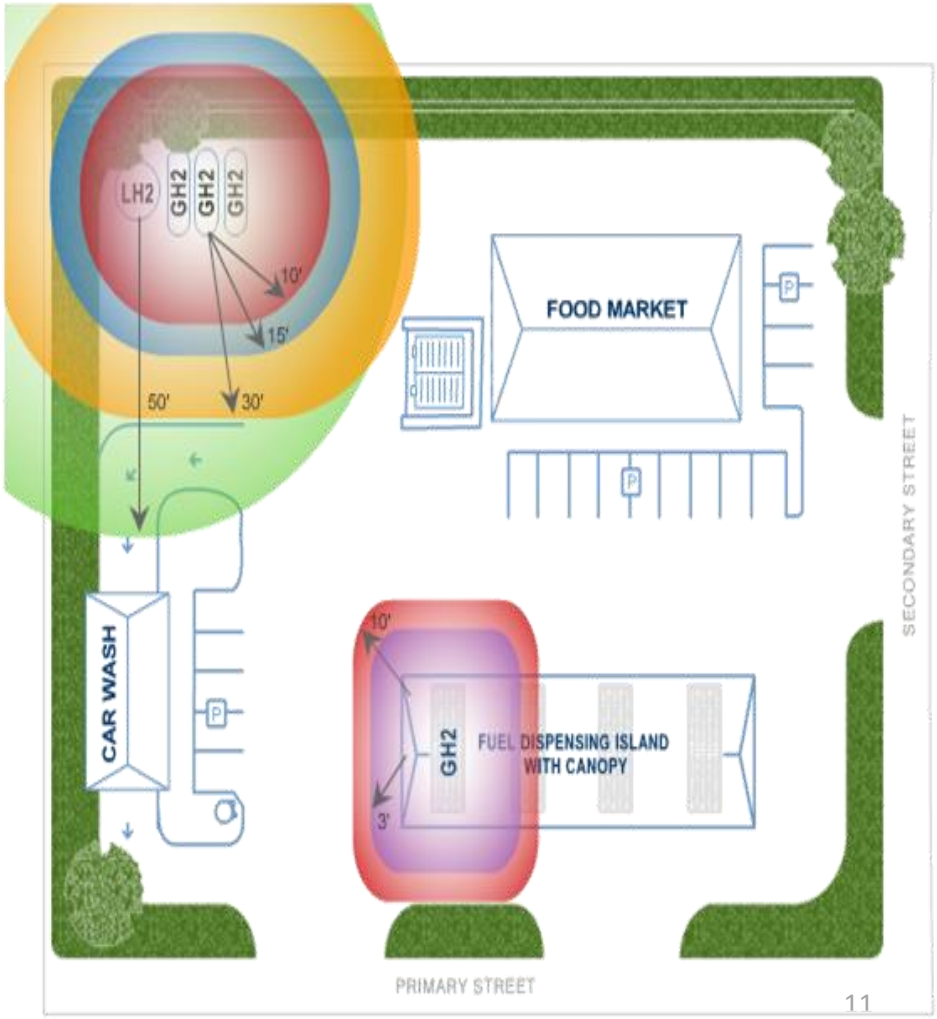


IPHE Education and Outreach Working Group – Examples of Activities

- **New IPHE logo and branded products launched:**
  - **IPHE intro video**
  - **Factsheet and Infographic** with IPHE member plans, global stats and station/car counts
  - **IPHE brochure**
- **Resource/information sharing on Hydrogen and Fuel Cell Day/Month**
  - **Teachers toolkit** and ***Increase your H2IQ*** **presentation**
- **Website updates underway**

IPHE Regulations, Codes and Standards Working Group – Example of Activities

- **Facilitate information sharing on lessons learned and best practices** focusing on the harmonization of codes and standards
- **Establish safety information and data exchange** to complement H_2tools and ongoing Japan-US efforts, EC efforts
- **Conduct webinars and workshops** focused on safety
- **Facilitate collaborations with relevant hydrogen safety organizations** through MOUs



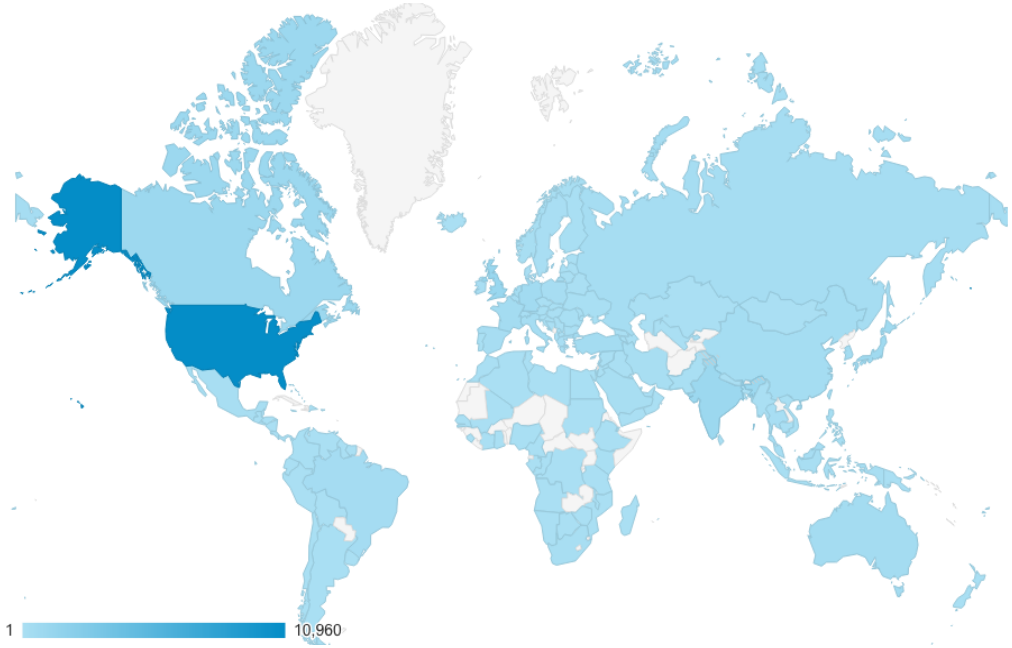
H_2 Safety Resources and Models Available Worldwide

H2Tools.org disseminates information on hydrogen safety

A Global Resource

More than 250,000 visits since 2015 - 50% are international

Portions translated to Japanese, other languages underway



Hydrogen Risk Assessment Models (HyRAM) for risk analysis under various scenarios. Can be applied to develop:

- Conduct **Quantitative Risk Assessment (QRA)** to guide code requirements
- Assess **Liquid Hydrogen Separation Distances**

HyRAM
HYDROGEN RISK ASSESSMENT MODELS

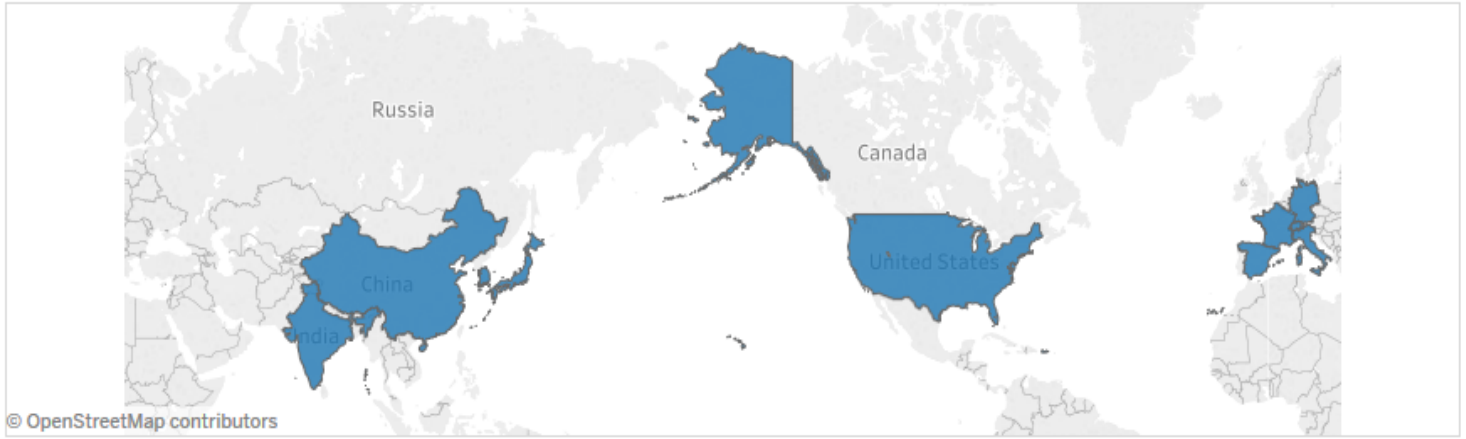
Global Energy Storage Database

Installations Over Time | ISO/RTO | Top 10 Countries | Use Cases

DOE Global Energy Storage Database

Last Updated 8/16/2016 1:25:38 PM

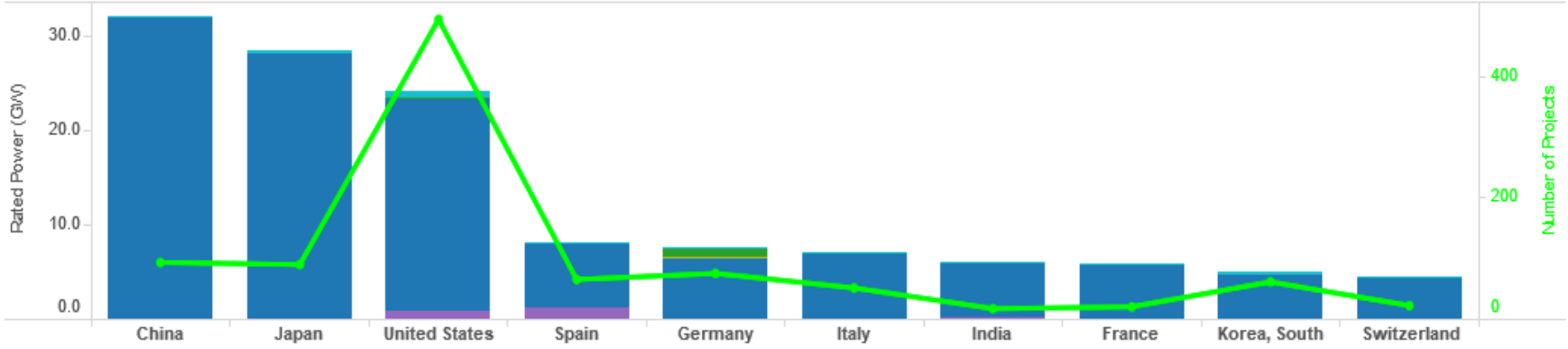
Top 10 Countries by Installed Capacity



Technology
(Multiple values)

Status
Operational

- Electro-chemical
- Electro-mechanical
- Hydrogen Storage
- Pumped Hydro Storage
- Thermal Storage

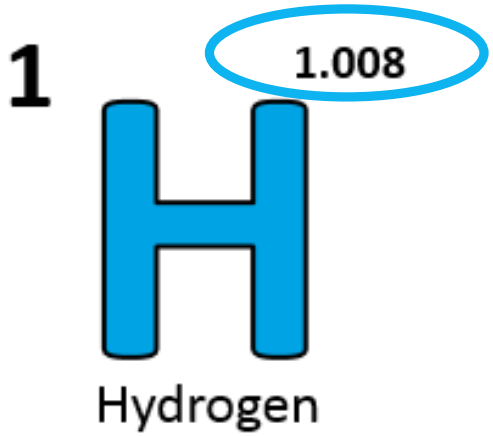


Source: US DOE Office of Electricity and Reliability

Outreach and Education Opportunity

Celebrate International Hydrogen & Fuel Cell Day on October 8

(Held on hydrogen's very own atomic- weight-day)



Ways you can get involved:

- **Download the Increase your H2IQ** training resource and share hydrogen and fuel cells information (visit: https://www.energy.gov/eere/fuelcells/downloads/increase-your-h2iq-training-resource)
- Use hashtags **#FuelCellsNow** and **#HydrogenNow** for social media activity
- **Host a 1.008 mile educational walk**
- **Visit H2Tools.org** to learn more about hydrogen safety