

U.S. DEPARTMENT OF
ENERGY

Office of
ENERGY EFFICIENCY &
RENEWABLE ENERGY

U.S. Department of Energy's Transportation and Hydrogen and Fuel Cell Perspectives

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NASEO 2020 Energy Policy Outlook Conference and Innovation Summit

February 7, 2020



Transportation Sector and DOE Activities



Transportation sector uses **30 Quads** of energy



~ **1/3** of all energy used in the US

Transportation is the **2nd** largest expense for U.S. households.



Transportation is the largest source of **CO₂**.



17 National Laboratories



\$700m/year in Transportation Research

World-class capabilities:

- High Performance Computing
- Artificial Intelligence
- Tools and Modeling

Driving Innovation:

- Reduced cost of batteries by **80%**



**NEW TECHNOLOGIES &
BUSINESS MODELS ARE
DRIVING
DISRUPTION**



**Shared
Mobility**



**Mobility
On
Demand**



**e-
Commerce**



**Connected &
Automated
Vehicles**



**Emerging
Fuels &
Powertrains**



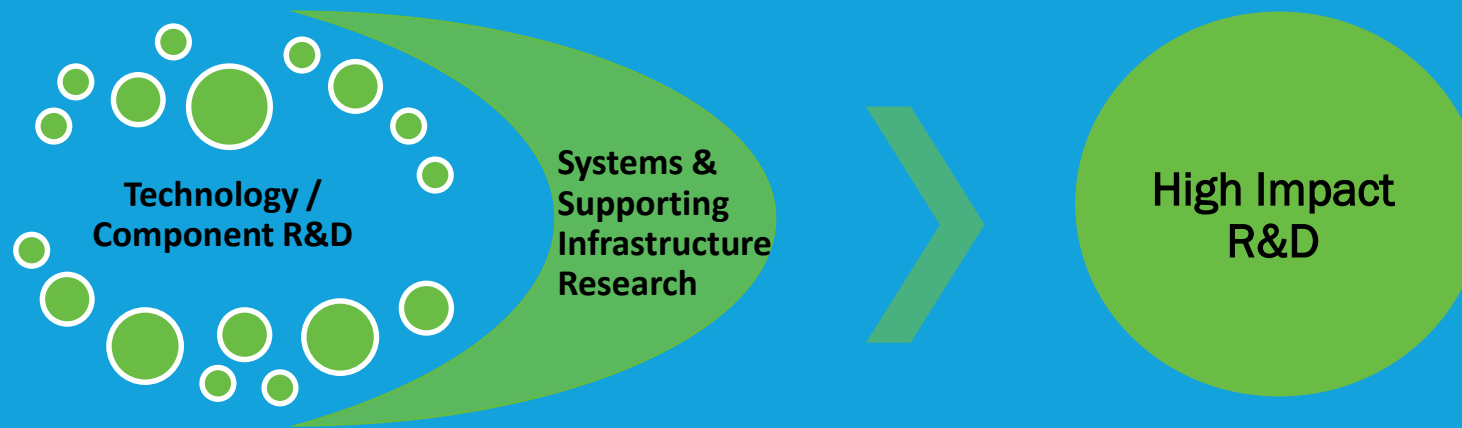
**New
Modes of
Transport**

DOE EERE TRANSPORTATION SECTOR

Energy Affordability

Energy Integration

Energy Storage



Vehicle Technologies (\$396M)

- Electrification
- Combustion engines
- Low cost lightweight materials
- New mobility & transportation systems

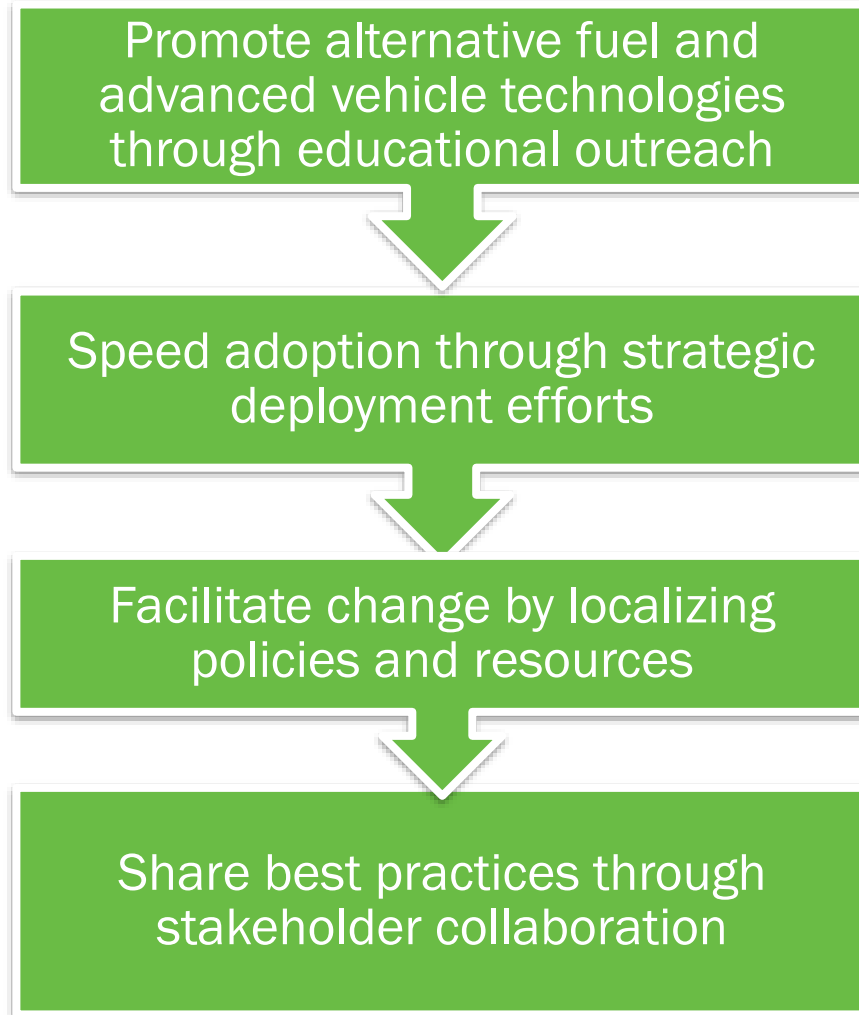
H2 & Fuel Cell Technologies (\$150M)

- Hydrogen production (e.g. electrolysis), storage
- Fuel cell systems
- H2@Scale

Bioenergy Technologies (\$259M)

- Biofuels and bioproducts
- New products, fuels, and chemicals from waste
- Energy crops

Clean Cities Coalitions



Light, Medium & Heavy-duty Vehicles



Alternative Fuel Infrastructure



Connectivity and Automation



Clean Cities Coalitions

Nearly 100 Clean Cities coalitions with thousands of stakeholders, representing ~80% of U.S. population

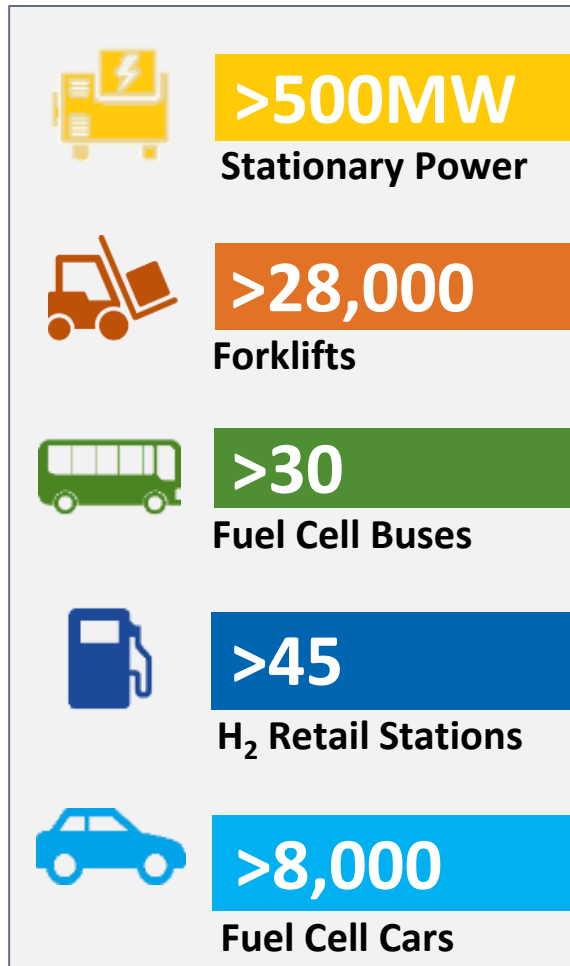


Clean City Coalition Results

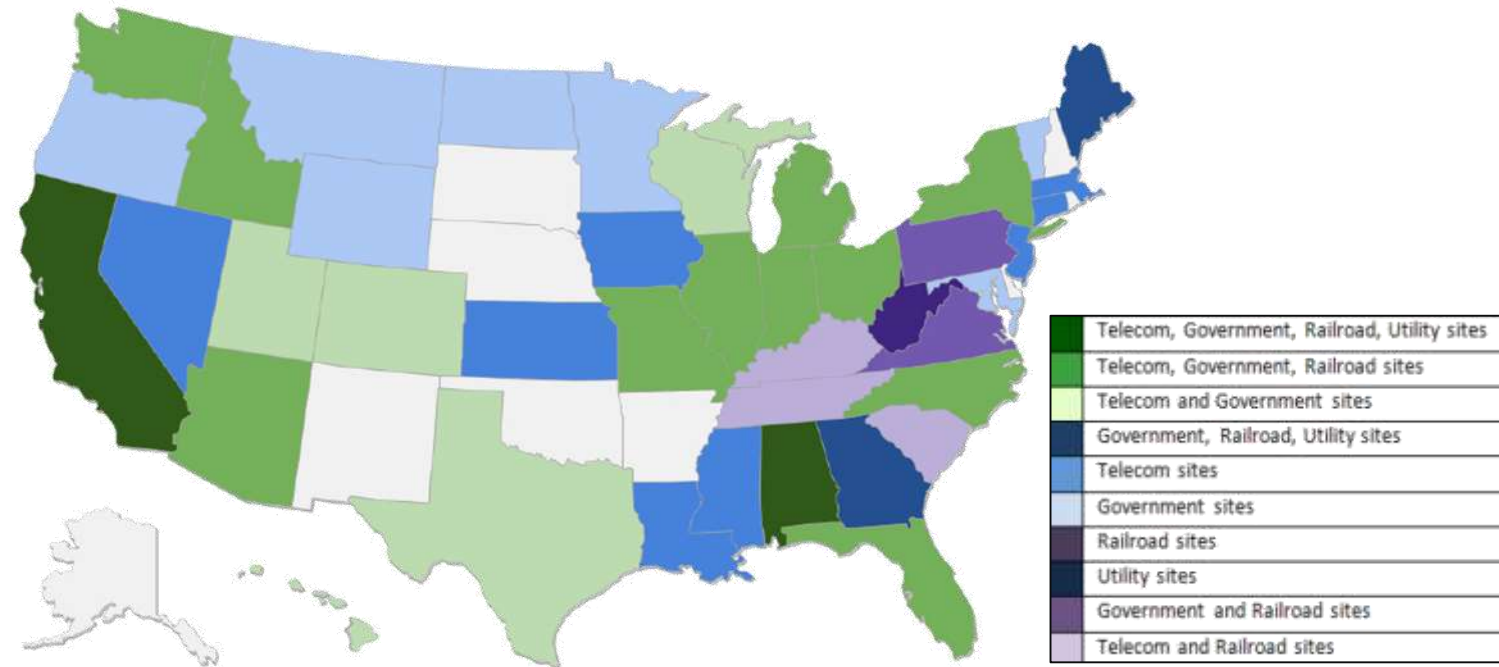
- Since 1993, cumulative energy impact of Clean Cities coalition activities surpassed 9.8 billion GGEs through alternative fuel use, fuel economy improvements, idle-reduction measures, and other strategies
- In 2018, nearly 1 million of the AFVs in operation were a result of Clean Cities coalition efforts.
- Coalitions leveraged nearly \$7 of project funding for every \$1 directed to coalitions by DOE

Snapshot of Hydrogen and Fuel Cells Applications in the United States

Examples of Applications



Examples of stationary fuel cell installations



- **Over 8,000 stationary units** include telecom/cell phone towers

Hydrogen Stations: Examples of Plans Across States

California

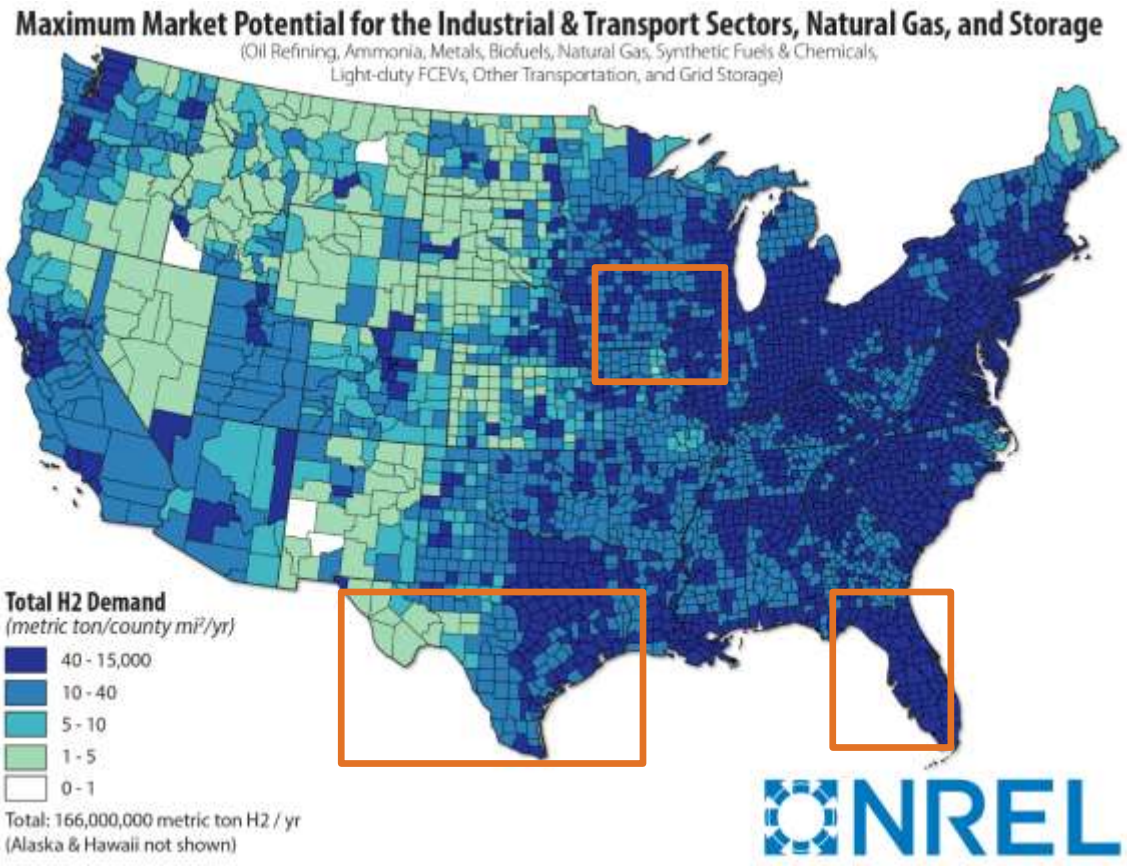
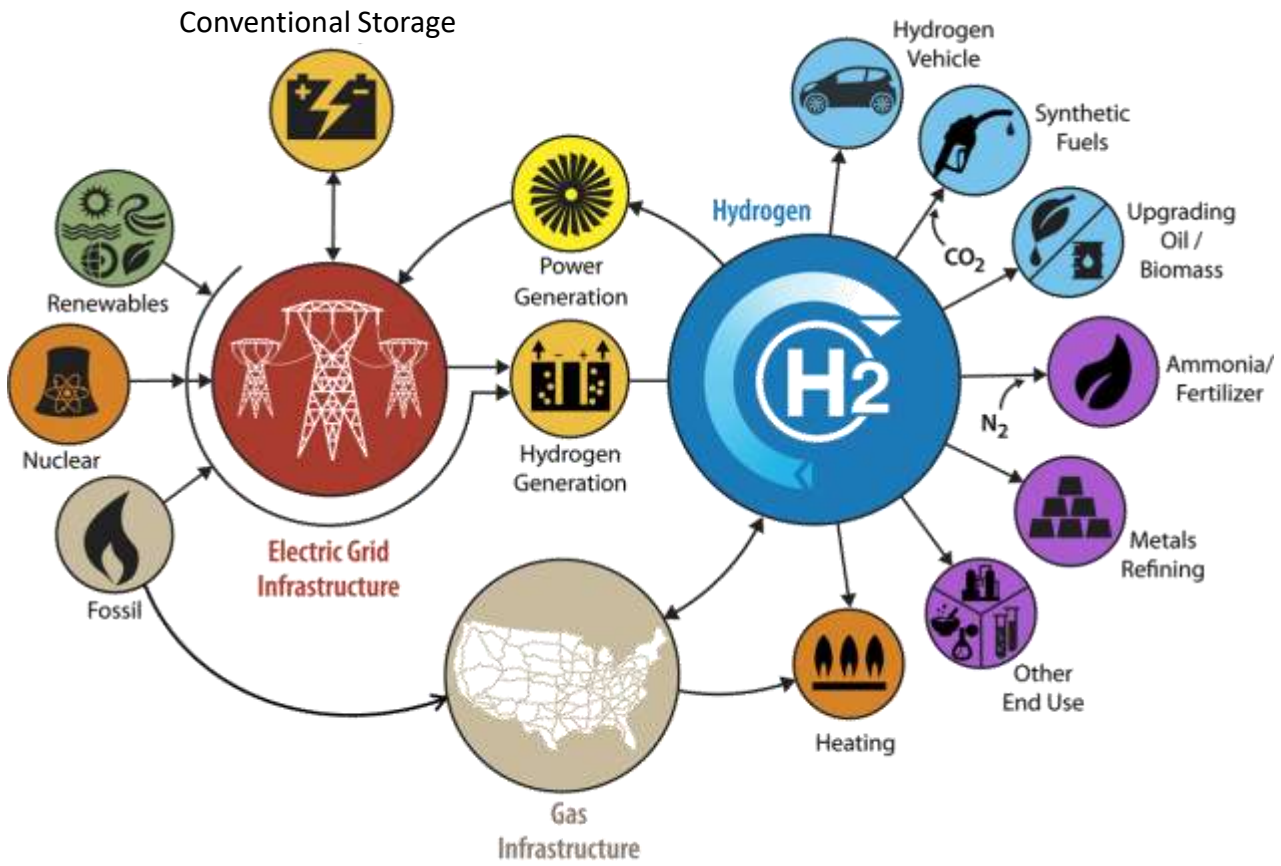
200 stations planned
CAFCP goal, 1000

Northeast

12 – 20 stations planned

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

H2@Scale: Enabling Affordable, Reliable, Clean, & Secure Energy Across Sectors



Hydrogen and Fuel Cell Program Budget (FY 2019): \$150M

H2@Scale demonstration projects just awarded in Texas, Illinois and Florida

Nearly \$300M in Funding Announced

- **Hydrogen and Fuel Cells - \$64M (DE-FOA-0002229)**
 - Concept papers due Feb 25; full applications due April 20.
 - 6 Topics from electrolyzer manufacturing; carbon fiber for compressed gas tanks; fuel cells and membranes for heavy duty applications; new markets for hydrogen (e.g. steel production); demonstrations for emerging applications (e.g. maritime, data centers), and workforce and training development).
- **Vehicles - \$133M (DE-FOA-0002197)**
 - Concept papers due Feb 21; full applications due April 14.
 - 16 topics from advanced batteries and electrification in support of the recently-announced DOE Energy Storage Grand Challenge; advanced engine and fuel technologies, including technologies for off-road applications and alternative fueled engines; lightweight materials; new mobility technologies and alternative fuels technology demonstrations).
- **Bioenergy - \$96M (DE-FOA-0002203)**
 - Concept papers due March 5; full applications due April 30
 - 7 topics from Scale up of Bench Applications to Biomass to Plastics Recycling to Restore Natural Resources to Scalable CO2 Electrolysis).

EMERGING FEEDSTOCKS (+traditional)

POTENTIALLY LOW-COST CARBON RESOURCES



FY 2020 Budget Plans Sustainable Transportation Technology Offices

Vehicles

Subprograms	FY 2020 Enacted (\$K)
Batteries and Electrification Technologies	174,700
Energy Efficient Mobility Systems and Vehicle Systems	45,000
Advanced Engines and Fuel Technologies	70,000
Materials Technology	40,000
Technology Integration	60,300
Data, Modeling and Analysis	6,000
Total	396,000

Bioenergy

Subprograms	FY 2020 Enacted (\$K)
Feedstock Supply and Logistics	40,000
Advanced Algal Systems	40,000
Conversion Technologies	110,000
System Development and Integration	60,000
Data, Modeling, and Analysis	9,500
Total	259,500

H₂ and Fuel Cells

Subprograms	FY 2020 Enacted (\$K)
Fuel Cell R&D	26,000
Hydrogen Fuel R&D	45,000
Hydrogen Infrastructure R&D	25,000
Technology Acceleration	41,000
Safety, Codes and Standards	10,000
System Analysis	3,000
Total	150,000

For more information

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Hydrogen and Fuel Cell Resources

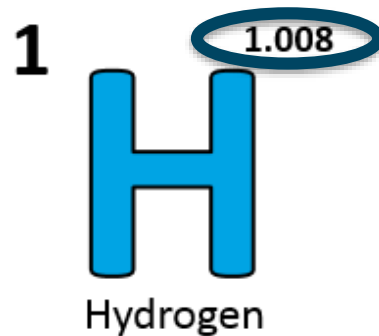
H2tools.org



Celebrate National Hydrogen & Fuel Cell Day

October 8 or 10/08

(Held on its very own atomic-weight-day)



Save the Date:

- **Feb 18 @ noon ET - H2IQ Hour:** What's New with the Hydrogen and Fuel Cell Program.
Register: www.energy.gov/eere/fuelcells/fuel-cell-technologies-office-webinars
- **May 19 – 22: Hydrogen and Fuel Cells Annual Merit Review** in Washington D.C.

Download the H2IQ resource for free:

energy.gov/eere/fuelcells/downloads/increase-your-h2iq-training-resource

INCREASE YOUR
H₂IQ



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