**Transportation Climate Initiative Comment**

**FCV deployment goals/expectations in TCI region in the next 15 years (business-as-usual):**

* Multi-State ZEV Task Force.[[1]](#footnote-1)
* Nine states have signed a Memorandum of Understanding, committing to deploying at least 3.3 million zero-emission vehicles by 2025 (California, Connecticut, Massachusetts, New York, New Jersey, Rhode Island, Vermont, Oregon, and Maryland).
* Originally signed by eight states, New Jersey officially joined the Task Force on May 3, 2018.
* If the goals of the MOU are achieved, the initial six Northeast states (New York, Massachusetts, Maryland, Connecticut, Rhode Island, and Vermont) could deploy approximately 639,000 FCVs/BEVs by 2025.[[2]](#footnote-2)
* Including similar commitments from New Jersey, New Hampshire, and Maine, regional deployment could reach over 800,000 FCVs/BEVs by 2025.
* H2USA’s Siting Refueling Stations in the Northeast report (based on Spatially and Temporarily Resolved Energy Environment Tool (STREET) and Scenario Evaluation Reorganization and Analysis Tool (SERA) station placement results).[[3]](#footnote-3)
* H2USA: Public-private collaboration between the Department of Energy, state governments, and industry to advance fuel cell and hydrogen infrastructure across the US.
* The 2017 report projects how a hydrogen refueling infrastructure in the Northeast could be deployed based on California deployment trends, attempting to best align projected fuel supply and FCEV demand.
* 2022 - Approximately 50 hydrogen refueling stations in the Northeast
  + 3 stations in the Boston, MA area.
  + 15 stations in the New York, NY area.
  + 10 stations in the Washington, DC area.
* 2027 - Approximately 250 hydrogen refueling stations in the Northeast
  + 30 stations in the Boston, MA area.
  + 100 stations in the New York, NY area.
    - Early Cluster: Manhattan, NY - 16 stations. Long Island, NY - 25 stations. Bergen County, NJ - 27 stations. Stamford, CT - 14 stations.
    - Later Cluster: Hazlett-Tinton Falls, NJ - 11 stations. Lower/Mid-Hudson, NY - 7 stations.
  + 20 stations in the Philadelphia, PA area.
  + 50 combined stations in the Washington, DC/Baltimore, MD area.

**Examples of how states are including hydrogen fuel cell vehicles in their transportation decarbonization/energy plans:**

* Northeast Hydrogen Station Development
  + Air Liquide is currently constructing twelve hydrogen fueling stations in the Northeast, including Providence RI, Braintree MA, Mansfield MA, Hartford CT, Hempstead NY, Bronx NY, Brooklyn NY, Lodi NJ, and Whippany NJ, to support the initial deployment of FCVs in high density areas.[[4]](#footnote-4)
* Potential for Northeast Fleets
  + H2USA and the Northeast Electrochemical Energy Storage Cluster (NEESC) developed a Fuel Cell Electric Vehicle Fleet Deployment Plan that lays out how fuel cell vehicle fleets could be implemented in the Northeast.[[5]](#footnote-5)
  + The 171,000+ passenger fleet vehicles in the Northeast are good candidates for replacement by FCVs, as they mostly operate on fixed routes and can be refueled at centralized hydrogen stations.
  + With approximately 15,600 buses for public transportation in the Northeast region, including 12,900 that use diesel fuel or are diesel hybrids, fuel cells present a new potential for energy savings with high efficiency options compared to conventional diesel and hybrids.
* California
  + From CARB’s 2016 evaluation of FCEV deployment and hydrogen infrastructure development:
    - *“Successful market launch and continued growth of both FCEVs and California’s hydrogen fueling network are essential for the State to meet zero-emission vehicle goals set forth in Governor Brown’s Executive Order B-16-2012 as well as greenhouse gas reduction, air quality improvement, and petroleum reduction goals set forth in state and federal laws and programs [1], [2], [3], [4], [5], [6], [7].”[[6]](#footnote-6)*
  + As of February 2019, there were 6,012 FCEVs actively registered in California.[[7]](#footnote-7)
    - As of February 1, 2019, there are 39 Open-Retail hydrogen refueling stations in California, with 25 more in development.
    - As of February 1, 2019, there are 30 fuel cell buses operating in California, with 22 buses and 4 shuttles currently in development.
  + The Clean Vehicle Rebate Project (CVRP), administered by the CSE for the California Air Resources Board (CARB), offers up to $7,000 in rebates for the purchase or lease of new, eligible zero-emissions and plug-in hybrid light-duty vehicles.[[8]](#footnote-8)
  + On January 28, 2018, Governor Brown issued an Executive Order with an accompanying budget request, which instructs California agencies to work towards a new hydrogen infrastructure goal of 200 stations by 2025, and 5 million zero emission vehicles by 2030.[[9]](#footnote-9)
  + California Air Resources Board estimates that the state’s currently-funded hydrogen fueling station network will provide hydrogen with a renewable content of 38% when fully built by 2020.
  + Based on the expected pace of FCV deployment, the fuel demand for hydrogen in California will reach an excess of 3.5 million kilograms per year by the end of 2019. Accounting for the deployment of fuel cell electric buses, the demand threshold will likely be crossed sooner this year.
* Massachusetts
  + The 2019 Massachusetts Offers Rebates for Electric Vehicles Program [(MOR-EV)](https://mor-ev.org/) offers rebates of up to $1,500 for the purchase/lease of battery electric and fuel cell electric vehicles.[[10]](#footnote-10)
* New York
  + New York’s Municipal ZEV Rebate Program includes a maximum rebate of $250,000 for a new hydrogen fueling facility.[[11]](#footnote-11)
  + The Drive Clean Rebate offers up to a $2,000 rebate for the purchase or lease of plug-in electric vehicles.[[12]](#footnote-12)
* New Jersey
  + All zero emission vehicles in the state of New Jersey are exempt from state sales and use taxes.[[13]](#footnote-13)
* Connecticut
  + The Connecticut Hydrogen and Electric Automobile Purchase Rebate Program (CHEAPR) offers a $5,000 rebate for hydrogen fuel cell vehicles.[[14]](#footnote-14)
  + Deployment of FCVs in the place of existing conventional fleet vehicles in Connecticut could reduce CO2 emissions by approximately 10,300 pounds per vehicle and NOx emissions by approximately 5.4 pounds per vehicle.[[15]](#footnote-15)
  + Connecticut Department of Energy & Environmental Protection (DEEP) has announced a solicitation of $840,000 to develop and operate a retail hydrogen station in the greater New Haven area.
* Maryland
  + The Maryland Alternative Fuel Infrastructure Program [(AFIP)](https://energy.maryland.gov/transportation/Pages/afip.aspx) provides grants for public access alternative fueling and charging infrastructure, with a maximum grant of $300,000 offered for the installation of a hydrogen refueling station.[[16]](#footnote-16)
  + Maryland Governor Larry Hogan has requested the Clean Cars Act of 2019, which would expand the electric vehicle excise tax credit to include the purchase of fuel cell electric vehicles.
* Pennsylvania
  + Pennsylvania’s Alternative Fuels Incentive Grant (AFIG) Program provides reimbursement grants for 50% of the cost, up to $500,000, of alternative fuel infrastructure installation, including hydrogen refueling stations.[[17]](#footnote-17)
  + The Alternative Fuel Vehicle Rebate Program offers rebates of up to $2,000 for plug-in hybrid electric vehicles, BEVs, and FCEVs.[[18]](#footnote-18)
* District of Columbia
  + Owners of Alternative Fuel Vehicles or vehicles with an average city fuel economy of 40 mpg are exempt from vehicle excise taxes.[[19]](#footnote-19)
* New Hampshire
  + By replacing conventional vehicles in the state, beginning with 25 FCVs (20 passenger vehicles, 5 buses), CO2 emission can be reduced by approximately 540 metric tons (90 by FCV, 540 by FCBs) and NOx emissions by .15 metric tons (.05 by FCV, 0.1 by FCB)
* Maine
  + Maine: citizens may credit or refund any portion of the premium charged for an insurance policy on a clean fuel vehicle, including FCVs, as long as insurance premiums on other vehicles are not increased to fund these credits or refunds.
  + Proposes a state incentive of $5,000 per FCV, following a state deployment plan of 144 passenger FCVs, and the development of up to two hydrogen refueling stations.[[20]](#footnote-20)
* Virginia
  + In 2018, Virginia enacted a [green job creation tax credit](http://lis.virginia.gov/cgi-bin/legp604.exe?181+sum+SB573), specifically mentioning hydrogen and fuel cells among sectors eligible for the credit.[[21]](#footnote-21)
* Colorado
  + On January 19, 2019, Governor Jared Polis issued an Executive Order outlining initiatives and strategies aimed at supporting a transition to zero emission vehicles. Notably, Colorado will focus all remaining funds from the Volkswagen emissions case towards the electrification of vehicles such as transit buses, school buses, and trucks.[[22]](#footnote-22)
  + Colorado offers a $5,000 tax credit for passenger electric vehicles.

**Total amount of public investment required to develop minimum level of coverage of H2 fueling infrastructure in TCI region:**

The California Energy Commission / California Air Resources Board in a 2018 joint agency report calculated that the fueling capacity at the time of the report (38 open retail stations, plus 25 in development) of 17,000 kilograms of hydrogen per day would be enough to support up to 24,000 fuel cell vehicles, with some variance depending on geographical deployment relative to station locations and driver habits.

The report also indicates that the capacity of the 110 projected open retail stations provided through state funding of $20 million annually from 2015 to 2024 would roughly match the projection of 47,200 FCEVs by 2024.

<https://www.energy.ca.gov/2018publications/CEC-600-2018-008/CEC-600-2018-008.pdf>

**Expected MPG equivalent of FCVs of different classes (light, medium, and heavy duty) and change over time through 2030:**

* According to the US EPA Fuel Economy Ratings, the current fuel cell vehicles on the market range from 56 - 68 miles per gallon of gas equivalent. Annual fuel cost for FCVs range from $1,250 to $1,500.[[23]](#footnote-23)
  + 2018 Honda Clarity: 68 MPGe combined, range: 366 miles
  + 2018 Hyundai NEXO: 57 MPGe combined, range: 354 miles
  + 2018 Hyundai NEXO Blue: 61 MPGe combined, range: 380 miles
  + 2019 Toyota Mirai: 67 MPGe combined, range: 312 miles
* FCEBs have an average fuel economy of 7.9 miles per kilogram of hydrogen (7 miles/diesel gallon equivalent)
  + Average fuel efficiency of conventional diesel busses is approximately 3.87 miles per gallon.
  + A bus powered by renewably sourced hydrogen could displace 79 to 131 metric tons of CO2/year of diesel bus emissions.[[24]](#footnote-24)
* NREL Spring 2018 FCV Performance Data[[25]](#footnote-25)
* Based on 239 FCVs, 7,390,424 miles driven, 177,428 trips, and 18,568 refuelings from 2006 to 2018.
* Average on-road Fuel Economy -
  + Median: 51.1 miles/kg
  + Min: 34, Max 57.5

1. [*Multi-State ZEV Task Force*](https://www.zevstates.us/) [↑](#footnote-ref-1)
2. [*2017 Northeast Regional Hydrogen Economy: Fuel Cell Electric Vehicle Fleet Deployment Plan*](http://h2usa.org/sites/default/files/2017_Regional_H2_Fleet.pdf) [↑](#footnote-ref-2)
3. [*H2USA: Siting Refueling Stations in the Northeast*](https://www.nrel.gov/docs/fy18osti/67401.pdf) [↑](#footnote-ref-3)
4. [*Air Liquide: Northeast Hydrogen Projects*](https://energies.airliquide.com/new-hydrogen-fueling-stations) [↑](#footnote-ref-4)
5. [*Fuel Cell Electric Vehicle Fleet Deployment Plan*](mailto:http://h2usa.org/sites/default/files/2017_Regional_H2_Fleet.pdf) [↑](#footnote-ref-5)
6. [*CARB: 2016 Annual Evaluation of Hydrogen and Fuel Cell Vehicle Deployment and Hydrogen Fuel Station Network Development*](https://www.arb.ca.gov/msprog/zevprog/ab8/ab8_report_2016.pdf) [↑](#footnote-ref-6)
7. [*CAFCP*](https://www.arb.ca.gov/msprog/zevprog/ab8/ab8_report_2018_print.pdf) *By the Numbers* [↑](#footnote-ref-7)
8. [*California: Clean Vehicle Rebate Project*](https://cleanvehiclerebate.org/eng) [↑](#footnote-ref-8)
9. [*California: Zero-Emission Vehicle Executive Order*](https://www.ca.gov/archive/gov39/2018/01/26/governor-brown-takes-action-to-increase-zero-emission-vehicles-fund-new-climate-investments/index.html) [↑](#footnote-ref-9)
10. [*Massachusetts Offers Rebates for Electric Vehicles Program*](https://mor-ev.org/) [↑](#footnote-ref-10)
11. [*New York: Municipal ZEV Rebate Program*](http://www.dec.ny.gov/energy/109181.html) [↑](#footnote-ref-11)
12. [*New York: Drive Clean Rebate*](https://www.nyserda.ny.gov/All-Programs/Programs/Drive-Clean-Rebate) [↑](#footnote-ref-12)
13. [*New Jersey: Zero Emission Vehicle (ZEV) Tax Exemption*](https://afdc.energy.gov/laws/5778) [↑](#footnote-ref-13)
14. [*Connecticut Hydrogen and Electric Automobile Purchase Rebate Program*](https://www.ct.gov/deep/cwp/view.asp?a=2684&q=561422&deepNav_GID=2183) [↑](#footnote-ref-14)
15. [*Fuel Cell Electric Vehicles: A Business Case for Clean Transportation in Connecticut*](http://chfcc.org/wp-content/uploads/2018/04/FCEV-Business-Case-1-30-18f.pdf) [↑](#footnote-ref-15)
16. [*Maryland Alternative Fuel Infrastructure Program*](https://energy.maryland.gov/transportation/Documents/Guidelines.pdf) [↑](#footnote-ref-16)
17. [*Pennsylvania: Alternative Fuels Incentive Grant*](https://www.dep.pa.gov/Citizens/GrantsLoansRebates/Alternative-Fuels-Incentive-Grant/Pages/default.aspx#.Vl9OeHarSUk) [↑](#footnote-ref-17)
18. [*Pennsylvania: Alternative Fuel Vehicle Rebate Program*](https://www.dep.pa.gov/Citizens/GrantsLoansRebates/Alternative-Fuels-Incentive-Grant/pages/alternative-fuel-vehicles.aspx) [↑](#footnote-ref-18)
19. [*DC: Department of Motor Vehicles*](https://dmv.dc.gov/node/155452) [↑](#footnote-ref-19)
20. [*Maine: Hydrogen and Fuel Cell Development Plans*](http://neesc.org/wp-content/uploads/2015/01/2018_ME_H2_Fuel_Cell_Dev_Plan_final2.pdf) [↑](#footnote-ref-20)
21. [*Virginia SB 573: Green job creation tax credit*](http://lis.virginia.gov/cgi-bin/legp604.exe?181+sum+SB573) [↑](#footnote-ref-21)
22. [*Colorado Executive Order: Transition to Zero Emission Vehicles*](https://www.colorado.gov/governor/news/gov-polis-signs-executive-order-supporting-colorado%E2%80%99s-transition-zero-emission-vehicles) [↑](#footnote-ref-22)
23. [*Fuel Cell Vehicles Fuel Economy*](https://www.fueleconomy.gov/feg/fcv_sbs.shtml) [↑](#footnote-ref-23)
24. [*Fuel Cell Electric Vehicle Deployment Plan*](http://h2usa.org/sites/default/files/2017_Regional_H2_Fleet.pdf) [↑](#footnote-ref-24)
25. [*Fuel Cell Electric Vehicle Performance Composite Data Products: Spring 2018*](https://www.nrel.gov/docs/fy18osti/71643.pdf) [↑](#footnote-ref-25)