September 19, 2018

Texas Commission on Environmental Quality
P.O. Box 13087
Austin, TX 78711-3087

RE: Comments Regarding Environmental Mitigation Plan

Summary

The Fuel Cell and Hydrogen Energy Association (FCHEA) congratulates the Texas Commission on Environmental Quality (TCEQ) for developing a draft Beneficiary Mitigation Plan (BMP) that encompasses many of the Eligible Mitigation Actions (EMA) described in Appendix D-2 of the Partial Consent Decree stemming from the Volkswagen "Clean Diesel" Marketing, Sales Practices and Products Liability litigation.[1]

Specifically, FCHEA thanks the TCEQ for including hydrogen and fuel cell technologies as EMA related to Class 8 trucks, Class 4 - 8 buses, freight switchers, ferries and tugs, Class 4 - 7 medium trucks, ground support equipment, forklifts and cargo equipment, and electric vehicle service equipment (EVSE).

The below comments describe why funding the deployment of hydrogen and fuel cell applications and infrastructure under the BMP is beneficial to the State of Texas; and urges additions to the BMP to advance that deployment.

1. Funding EVSE Infrastructure for FCEV is Feasible and Prudent

Several factors make funding EVSE infrastructure for FCEV feasible and a prudent use of EMT monies. First, consumer understanding of and interest in ZEV is growing.[2] Increasingly, consumers include vehicle efficiency and new vehicle technology features as a key purchase characteristics. Here, FCEV excel, offering 300-400 miles of driving range per tank, refueling in less than five minutes and operating quietly with highly responsive performance characteristics. FCEV are safe, reliable and require little maintenance.

Next, hydrogen and fuel cell technologies are highly adaptable. Fuel cell- powered trucks are operating in leading U.S. ports. Fuel cell electric buses (FCEB) are in transit, shuttle, and student

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[1] "Draft Beneficiary Mitigation Plan for Texas", August 8, 2018
https://www.tceq.texas.gov/assets/public/implementation/air/terp/VW/RG-537-Draft-for-Public-Review-180801.pdf
"Appendix D-2, Eligible Mitigation Actions and Mitigation Action Expenditures," United States of America v. Volkswagen AG et al., Case No. 16-cv-295 (N.D. Cal.)
https://www.vwcourtsettlement.com/en/docs/DOJ/Approved%20Appendix%20D-2.pdf
[2] "Monthly Plug-In Sales Scorecard," Inside EVs
http://insideevs.com/monthly-plug-in-sales-scorecard/

transportation operations in twelve States. Fuel cells power forklift fleets at major distribution centers in Texas.[3] Elsewhere, fuel cells power cargo tractors at Memphis International Airport and forklifts operating in warehouses, distribution centers and ports nationwide.

Hydrogen producers, fuel cell manufacturers and infrastructure component manufactures are capable of utilizing EMA to deliver projects successfully. Hydrogen producers include highly capitalized multi-national industrial gas companies. Leading automakers have FCEV development programs together to have invested more than an estimated $9 billion to improve technical performance and manufacturing efficiencies.[4] Since 2014, non-government entities have invested more than $96 million in a growing network of hydrogen refueling stations in California.[5] As the hydrogen fuel cell supply chain rapidly matures, hydrogen refueling station construction costs and completion times are shrinking; hydrogen production costs are dropping; and new production processes have enhanced renewable hydrogen availability.[6]

Hydrogen refueling infrastructure ("networks") can be deployed in a timely manner. Twenty-four months are typically needed to construct a refueling station, according to an analysis by the California Energy Commission.[7] Hydrogen refueling infrastructure does not require significant investment in power and natural gas infrastructure; does not require significant investment in power and natural gas infrastructure; and is not real estate intensive. Given its ability to refuel an FCEV in less than five minutes, a single hydrogen dispenser can refuel 300 cars per day.

Next, a dynamic regulatory environment is working to accelerate hydrogen fuel cell commercialization. California has set standards for hydrogen metrology and refueling station design, construction, installation and operation.[8] National standards for hydrogen quality and refueling station safety have been set. States and municipalities are evaluating roadway access and transport rules to assure facility safety and to improve the efficient movement of

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[3] Ace Hardware Retail Support Center, Wilmer (Dallas Co.); HEB Distribution Center, San Antonio (Bexar Co.); Nestle Waters Bottling Facility, Dallas (Dallas Co.); Sysco Distribution Center, Schertz (Guadalupe Co.); Sysco Distribution Center, Houston (Harris Co.); Wal-Mart Distribution Center, New Caney (Montgomery Co.)

[4] "The Hydrogen Transition: This Time, for Real?," Institute of Transportation Studies. Retrieved June 28, 2017
https://its.ucdavis.edu/blog-post/the-hydrogen-transition-this-time-for-real/
"Fuel Cell Electric Vehicles," H_2USA. Retrieved June 28, 2017
http://h2usa.org/fuel-cell-electric-vehicles

[5] "2016-2017 Investment Plan Update for the Alternative and Renewable Fuel and Vehicle Technology Program," California Energy Commission, May, 2016, Page 20
http://www.energy.ca.gov/2015publications/CEC-600-2015-014/CEC-600-2015-014-CMF.pdf
"Grants Approved for Northern California Hydrogen Stations," California Energy Commission, August 9, 2017
http://www.energy.ca.gov/releases/2017_releases/2017-08-09_grants_forest_waste_to_energy_nr.html

[6] "Joint Agency Staff Report on Assembly Bill 8: 2016 Assessment of Time and Cost Needed to Attain 100 Hydrogen Refueling Stations in California," January, 2017, Page 2
http://www.energy.ca.gov/2017publications/CEC-600-2017-002/CEC-600-2017-002.pdf

[7] "Joint Agency Staff Report on Assembly Bill 8: 2016 Assessment of Time and Cost Needed to Attain 100 Hydrogen Refueling Stations in California," January, 2017, Page 22
http://www.energy.ca.gov/2017publications/CEC-600-2017-002/CEC-600-2017-002.pdf

[8] "Retail Hydrogen Fueling Regulations," 7 CCR 1101-17
http://www.sos.state.co.us/CCR/GenerateRulePdf.do?ruleVersionId=6964

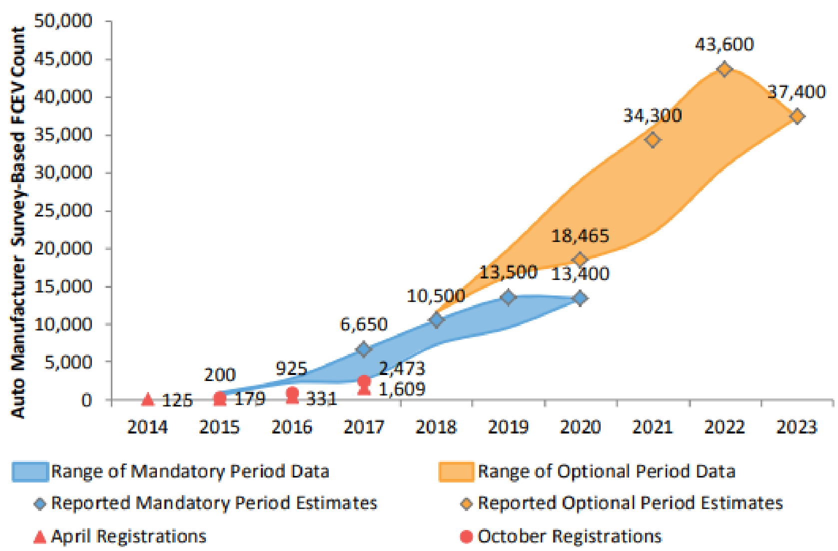
hydrogen. Together, Texas decision-makers have a robust "tool box" from which to develop effective hydrogen-related policies.

Next, State policymakers have ready access to network planning expertise. Station developers with "real world" experience gained from planning and building California's hydrogen station network are available to share best practices. Developers have significant subject matter expertise regarding fuel cell application and infrastructure design, planning and implementation. FCHEA member companies look forward to sharing their expertise with stakeholders as projects are designed, planned and implemented. The U.S. Department of Energy-affiliated research laboratories provide sophisticated technical services; for instance, network planning tools that model preferred station locations, hydrogen production, and FCEV costs.

2. Funding EVSE Infrastructure Incentivizes Deployment of Fuel Cell Vehicles

Funding refueling infrastructure incentivizes continued automaker investment in innovative technologies advancing Zero Emission Vehicles (ZEV) deployment, including FCEV.[9] Currently, Toyota, Honda, and Hyundai sell or lease light-duty FCEV in selected U.S. markets. California, the initial deployment market, more than 4,800 FCEV are on the road as of June 6, 2018. The California Air Resources Board (CARB) projects 13,000 - 18,000 FCEV will be on the road by 2020; and as many as 43,000 FCEV by2022 (see chart, below).[10]

Figure 7: FCEV Count Projections



Source: CARB

[9] See Appendix A

[10] Joint Agency Staff Report on Assembly Bill 8: 2017 Annual Assessment of Time and Cost Needed to Attain 100 Hydrogen Refueling Stations in California
http://www.energy.ca.gov/2017publications/CEC-600-2017-011/CEC-600-2017-011.pdf

Automakers, hydrogen producers and Federal and State agencies are working to advance FCEV deployment nationally. Via H_2USA, the public-private partnership promoting U.S. FCEV deployment, the Department of Energy's National Renewable Energy Laboratory (NREL) developed a 50-State roadmap describing FCEV and hydrogen refueling station deployment.[11]

Among others, the report sites three conclusions deserving special note by State policy-makers. First, robust networks of hydrogen stations must be established in advance of selling large volumes of FCEVs into any given urban area. Following the rollout of stations planned for California, by 2025 a total of 320–570 additional stations would be required both in California and nationwide to enable significant FCEV market growth. Intensive stakeholder coordination and planning activities should precede the introduction of these initial stations to ensure progress toward a national milestone of "500 in 2025."

Next, there are multiple means of achieving FCEV market growth beyond California. Although the ZEV mandate has been a key policy driver in California, high concentrations of early adopters in other cities and states— combined with track records of strong support for advanced vehicles— suggest many other markets are promising for FCEV sales and hydrogen station investments.

Last, large cities with high concentrations of early adopters and strong market support mechanisms, as demonstrated in California, are assumed to be the most promising markets for introducing FCEVs and hydrogen station networks. With adequate market support mechanisms in place, these markets could prove to be the most promising options for rapidly achieving vehicle growth and substantial hydrogen demand, thereby reducing the financial risk posed to hydrogen station investors.

3. Use Hydrogen Production Leadership to Achieve Clean Transportation Fuels Leadership

As the Nation's leading producer of hydrogen, Texas is advantageously positioned to achieve leadership in clean transportation fuel use. Texas is home to more than two dozen hydrogen production facilities.[12] The facilities have the capacity to produce more than 406 Million Standard Cubic Feet per Day (MMSCFD) of hydrogen.[13] To move gaseous hydrogen, Texas

[11] "Siting Refueling Stations in the Northeast"
http://h2usa.org/sites/default/files/H2USA_LRWG_NEFactsheet.pdf
"National Hydrogen Scenarios: How may stations, where and when?
http://h2usa.org/sites/default/files/H2USA_LRWG_NationalScenarios2017.pdf
[12] "Texas Hydrogen Production Facilities," Energy Information Administration, June, 2016
https://h2tools.org/hyarc/hydrogen-production
[13] "North American Merchant Hydrogen Plant Production Capacities," Energy Information Administration, June. 2016
https://h2tools.org/hyarc/hydrogen-production
"U.S. Refinery Captive, On-purpose Hydrogen Production Capacity by State," Refinery Capacity Report, Energy Information Administration, June, 2016
https://h2tools.org/hyarc/hydrogen-production

companies own 938.2 miles of intrastate and interstate pipelines.[14] Together, these factors can combine to make hydrogen an affordable transportation fuel.

Hydrogen is already produced for industry and agricultural applications at a scale that would fuel many millions of vehicles, if the hydrogen was redirected to the transportation fuels market. This existing large-scale industrial production infrastructure is based largely on the conversion of natural gas to hydrogen via steam-methane reforming; the hydrogen supplies primarily the refinery and fertilizer production processes, with a limited amount being directed to production of metals, electronics and manufactured goods. Existing infrastructure includes large centralized production and a mature distribution network including pipelines and over-road distribution of both gaseous and liquid hydrogen.

The development of this new hydrogen infrastructure, optimized for the scale needed for mobility applications, will be the primary driver for cost-reductions in the supply of hydrogen. In addition to the implementation at scale, there are a few major developments that will impact large-scale hydrogen production costs. First, increased consumption of renewable hydrogen. Second, the expansion of liquid hydrogen production will provide a great reduction in the cost of storage, delivery, and production of hydrogen due to its greater energy density compared to gaseous hydrogen. A number of developments are underway within the industry to expand liquid hydrogen production. Last, the utility industry's growing use of hydrogen as an energy storage mechanism will greatly increase hydrogen's cost-value dynamic. Via an initiative called H2@Scale[15], the Department of Energy and the fuel cell and hydrogen industries, are researching hydrogen storage technology's potential impacts on power generation, system resiliency and transmission.

4. Fuel Cell Technologies Advance Sustainability and Innovation

Fuel cell technologies have the demonstrated capabilities to replace on-road and non-road diesel vehicles and engines regularly operating in or near areas that bear a disproportionate share of the air pollution burden. As noted above, fuel cells power trucks, buses, cargo tractors and forklifts successfully operate in ports, airports and warehouse distribution centers. Because these facilities are often located in areas with high population and/or traffic density, use of fuel cell powered engines and vehicles at such sites address those concerns.

Fuel cell technologies are in the forefront of ZEV innovation and sustainability. Seeking to promote innovation in energy supply, leading global energy, transport and industrial companies have pledged to accelerate their investments in hydrogen and fuel cell development and commercialization.[16] In the United States, Department of Energy programs have advanced

[14] "Pipelines," Energy Information Administration, June, 2016
http://www.eia.gov
[15] "H2@Scale," U.S. Department of Energy
https://www.energy.gov/eere/fuelcells/h2-scale
[16] "How Hydrogen Empowers the Energy Transition," The Hydrogen Coalition, January, 2017

innovation by successfully generating more than 580 patents, more than 30 commercial technologies, and 65 technologies that are expected to reach commercial scale within the next three to five years.[17]

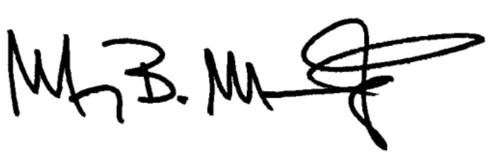
Hydrogen-powered fuel cells are efficient, using as much as 60 percent of available energy compared to internal combustion engines. Fuel cell electric drivetrains do not emit any greenhouse gases (GHG) during operation. Depending on how the hydrogen is produced, there are substantially fewer or no upstream GHG emissions compared with fossil fuels.[18]

5. Define "Recharging" to include "Refueling"

The draft Mitigation Plans' Appendix C describes eligible mitigation actions. Eligible Actions 2 through 8 include criteria stating "Up to 60% of the costs for charging infrastructure associated with a project involving all-electric vehicles and equipment may also be included. Charging infrastructure will be considered a separate activity under a project application."[19] FCHEA urges TCEQ to include in each section a statement clarifying that "charging infrastructure" includes infrastructure used to refuel vehicles using hydrogen fuel cell-produced electricity for motive power. Including such a statement is justified and beneficial. Each section is referring to infrastructure used to re-power "All-Electric" vehicles or engines, and the Environmental Mitigation Trust Agreement's Appendix D-2 defines the term "All-Electric" to mean "… powered exclusively by electricity provided by a battery, fuel cell, or the grid."[20] Omitting such a statement creates confusion, may limit receipt of grant proposals and reduces access to potentially available coordinated project finance sources.

Thank you for your consideration of these comments. If you have any questions, please contact me at mmarkowitz@fchea.org.

Sincerely,



Morry Markowitz, President
Fuel Cell and Hydrogen Energy Association

http://hydrogencouncil.com/

[17] "Pathways to Commercial Success: Technologies and Products Supported by the Fuel Cell Technologies Office," U.S. Department of Energy, Page 3-2
https://energy.gov/sites/prod/files/2016/02/f29/fcto_2015_pathways_commercial_success.pdf

[18] "Hydrogen Fuel Cell Vehicles," Center for Climate and Energy Solutions
https://www.c2es.org/technology/factsheet/HydrogenFuelCellVehicles

[19] "Draft Beneficiary Mitigation Plan for Texas", Appendix C – Eligible Mitigation Actions, Section 2(n), 3(n), 4(m), 5(k), 6(j), 7(l), 8(i), August 8, 2018
https://www.tceq.texas.gov/assets/public/implementation/air/terp/VW/RG-537-Draft-for-Public-Review-180801.pdf

[20] "Appendix D-2, Eligible Mitigation Actions and Mitigation Action Expenditures," Page 10

Appendix A

SIGNIFICANT FUEL CELL ELECTRIC VEHICLE TECHNOLOGY INVESTMENTS
By Vehicle Type and Manufacturer/User

Passenger Vehicles

In June 2018, Hyundai and Audi announced a multi-year patent cross-licensing agreement, covering a broad range of FCEV components and technologies.[21]

In May, 2018, Toyota announced plans to open a hydrogen fuel cell component factory in Japan by 2020, along with other new facilities to expand FCEV production. The facilities will enable Toyota to meet its goal of selling more than 30,000 fuel cell-powered passenger vehicles and commercial passenger vehicles globally each year.[22]

In August, 2017, Hyundai's fuel cell component manufacturing subsidiary completed construction of a facility capable of producing 3,000 fuel cell powertrain modules per year. The company says it will raise the facility's capacity to tens of thousands of modules in the future, depending on market demand.[23]

In April, 2017, Kia announced plans to market an FCEV by 2020.[24]

In January, 2017, Honda and General Motors announced joint plans to construction an $85 million fuel cell manufacturing facility in southeast Michigan. The companies plan to mass-produce an FCEV by 2020.[25] The facility is part of the company's plans to co-develop a next-generation fuel cell and hydrogen storage system.

Since 2012, Toyota and BMW have collaborated on the joint-development of a fuel cell vehicle system (fuel cell stack, tank, motor, battery), aiming for completion in 2020.[26] BMW plans to produce a low-volume fuel cell car in 2021, expanding availability in 2025.[27]

Commercial Trucks and Buses

In June, 2018, Seven-Eleven Japan Co. announced plans to introduce two new compact fuel cell trucks developed by Toyota for restocking outlets in the Tokyo metropolitan area. Seven-Eleven Japan plans to deploy more of the trucks after confirming their performance.[28]

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[21] https://www.detroitnews.com/story/business/autos/general-motors/2017/01/30/general-motors-honda-fuel-cell/97235454/
[22] https://www.reuters.com/article/us-toyota-fuelcell/toyota-to-ramp-up-hydrogen-fuel-cell-vehicle-sales-around-2020-idUSKCN1IP0JU
[23] http://english.yonhapnews.co.kr/news/2017/08/08/0200000000AEN20170808008300320.html
[24] https://www.cnet.com/roadshow/news/expect-a-hydrogen-fuel-cell-kia-by-2020/
[25] https://www.detroitnews.com/story/business/autos/general-motors/2017/01/30/general-motors-honda-fuel-cell/97235454/
[26] https://www.press.bmwgroup.com/global/article/detail/T0136503EN/bmw-group-and-toyota-motor-corporation-deepen-collaboration-by-signing-binding-agreements?language=en
[27] http://www.bmwblog.com/2017/03/29/bmw-produce-low-volume-hydrogen-fuel-cell-car-2021/
[28] https://www.japantimes.co.jp/news/2018/06/07/business/seven-eleven-use-toyota-fuel-cell-trucks-deliveries-next-year/#.WzP1CtJKi70

In May, 2018, Plug Power, a hydrogen and fuel cell technology company, and Workhorse, an equipment manufacturer, announced delivery to FedEx Express of a fuel cell-powered Class 5 delivery vehicle. [29]

In May, 2018, Nikola Motor Company, a Phoenix truck manufacturer, announced it had received an order for 800 fuel cell-powered truck tractors from Anheuser-Busch. The brewer seeks to add the vehicles to its fleet by 2020. The Anheuser-Bush order boosts Nikola's total orders to more than 8,000 units.[30]

In January, 2018, Kenworth demonstrated a fuel cell-powered Class 8 truck tractor for use in drayage operations at the Port of Long Beach, California.[31]

In May, 2017, US Hybrid, a California-based company, and Jiangsu Dewei Advanced Materials Co., a China-based company, announced a joint venture expanding fuel cell power system production capacity in the U.S. and China. The expansion will enable the companies to build and to deliver 2,000 systems annually in the U.S. and 2,000 systems annually in China."[32]

In May, 2017, UPS announced plans to deploy a prototype extended range fuel cell-powered Class 6 delivery van in the Sacramento, California area. The vehicle meets the same route and range requirements UPS has established for its conventional fuel vehicles.[33]

In April, 2017, Toyota began testing a fuel cell-powered Class 8 truck tractor for use in drayage operations at the Port of Long Beach, California.[34]

Fuel cell systems for buses are manufactured by Hyundai, New Flyer, Toyota, Wrightbus, and Ballard Power Systems.

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[29] http://www.ir.plugpower.com/Press-Releases/Press-Release-Details/2018/Plug-Power-and-Workhorse-Provide-FedEx-Express-With-First--ProGen-Fuel-Cell-Powered-Electric-Delivery-Van/default.aspx
[30] https://www.trucks.com/2018/05/07/anheuser-busch-nikola-truck-order-hydrogen-highway/
[31] https://www.kenworth.com/news/news-releases/2018/january/t680-zect/
[32] https://ushybrid.com/us-hybrid-announces-china-fuel-cell-joint-venture-and-unveils-class-8-fuel-cell-port-drayage-truck-for-san-pedro-ports/
[33] https://www.pressroom.ups.com/pressroom/ContentDetailsViewer.page?ConceptType=PressReleases&id=1493730807330-217
[34] http://corporatenews.pressroom.toyota.com/releases/toyota+zero+emission+heavyduty+trucking+concept.htm