

**This document has been prepared as part of the implementation project of Legal Pathways to Deep Decarbonization (Michael B. Gerrard and John C. Dernbach, eds. Environmental Law Institute [2019]) (LPDD). For background information on the project, see <https://lpdd.org>**

## **MEMORANDUM SUPPORTING MODEL STATE STATUTE FOR REBATES FOR HYDROGEN FUEL CELL VEHICLES AND FUELING STATIONS**

There is a strong consensus in the scientific community that profound changes are occurring in the world's climate; that these changes are due in large measure to human activities; and that the consequences of unchecked climate change pose grave risks to the environment, human health and socioeconomic stability. See, e.g., “*Climate Science Special Report, Fourth National Climate Assessment*,” (the “*National Climate Assessment*”) which was released by the federal government on November 17, 2017 (“Earth’s climate is now changing faster than at any time in the history of modern civilization, primarily as a result of human activities.”)<sup>1</sup> The symptoms of climate change are now readily apparent: average global temperatures are increasing inexorably, sea levels are rising measurably, glaciers are retreating, arctic sea ice is disappearing, ocean waters are warming, permafrost is thawing, record droughts are occurring, wildfires are becoming more intense and storms are becoming more severe.”<sup>2</sup>

The U.S. is not immune to such impacts. Recent years have seen record wildfires break out in the west, unprecedented flooding in the mid-west and devastating storms along our coasts. Over the longer term, reports published by NASA, Columbia University, and Cornell scientists in 2015<sup>3</sup> and 2016<sup>4</sup> predict that “megadroughts” (i.e., droughts of the depression-era “dust bowl” magnitude, but lasting for decades) “could become commonplace” in the southwest and U.S. plain states “if climate change goes unabated.” *Id.* at 6. It is predictions such as these that have led the 2019 report of the World Economic Forum to identify the “failure of climate change mitigation and adaptation” to be one of the *top risks* facing society – ahead of weapons of mass destruction, cyber-attacks, terrorism and the increasing scarcity of potable water.<sup>5</sup>

The December 12, 2015 Paris Agreement aims to avoid the worst impacts of climate change by holding the increase in average global temperatures to “well below 2°C above pre-industrial levels” with efforts “to limit the temperature increase to 1.5°C above pre-industrial levels.”<sup>6</sup> Achieving these goals will be a daunting task, requiring that greenhouse gas emissions from industrial countries like

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<sup>1</sup> U.S. Global Change Research Program, *Fourth National Climate Assessment*, p.34.

<https://www.globalchange.gov/browse/reports/climate-science-special-report-fourth-national-climate-assessment-nca4-volume-i>

<sup>2</sup> *Id.* at 37.

<sup>3</sup> Benjamin I. Cook, Toby Ault, & Jason Smerdon, “Unprecedented 21<sup>st</sup> Century Drought Risk in the American Southwest and Central Plains States,” *SCIENCE ADVANCES* (Feb. 12, 2015), <http://advances.sciencemag.org/content/1/1/e1400082>.

<sup>4</sup> Toby Ault, Justin S. Mankin, Benjamin I. Cook & Jason E. Smerdon, “Relative Impacts of Mitigation, Temperature, and Precipitation on 21<sup>st</sup>-Century Megadrought Risk in the American Southwest,” *SCIENCE ADVANCES* (Oct. 5, 2016), <http://advances.sciencemag.org/content/2/10/e1600873>.

<sup>5</sup> *The Global Risks Report 2019*, Part I, WORLD ECON. FORUM, <https://www.weforum.org/reports/the-global-risks-report-2019>

<sup>6</sup> *Id.* The NASA Study indicates that the risks of a megadrought occurring in the Western U.S. drop sharply – to a range from 30-60 percent in a 2°C warming scenario. See, e.g., <https://www.ecowatch.com/megadroughts-2031955357.html>.

the U.S. be reduced by about 80 percent by 2050. Reductions of this magnitude will take a colossal effort by virtually all levels of government in the U.S. and all sectors of the economy.

A book published by the Environmental Law Institute, entitled *Legal Pathways to Deep Decarbonization in the United States* (Michael Gerrard & John Dernbach, Eds., ELI 2019) (“LPDD”), has identified more than 1000 legal strategies that can be taken to achieve dramatic greenhouse gas emission reductions in the United States. Many of those pathways are focused on shifting transportation fuel sources in the U.S. away from fossil fuels, at a level that would result in the deployment of approximately 300 million alternative fuel vehicles – particularly electric vehicles (“EVs”), plug-in hybrid electric vehicles and hydrogen fuel cell vehicles (“HFCVs”).

While it is true that production of hydrogen fuel is currently carbon intensive, since it relies on fossil fuels, hydrogen will most likely be produced with increasing amounts of energy derived from renewable sources like wind power and solar energy and thereby become a clean fuel in a full-life cycle analysis. Moreover, according to LPDD, “although the EVs emit less air and GHG pollutants, a full life-cycle analysis indicates that they may emit more toxins over their lifetime [than internal combustion vehicles] because of pollutants associated with lithium mining and disposal.” LPDD at 364, n. 149.

Thus, emission-free hydrogen fuel cell vehicles fueled by clean energy-hydrogen could play an important role in the decarbonization of the transportation system in the United States. This is especially so because HFCVs can be fully refueled in three to five minutes, and their range reaches 300 miles or more per tank refill. Moreover, their range does not degrade in extreme temperatures, so they may be better suited than battery electric vehicles to extreme environments and long distance travel.

Two of the most significant barriers to the public’s acceptance of HFCVs are their cost and the scarcity of refueling stations. HFCVs are expensive: the sales price for 2021 models exceeds \$50,000.<sup>7</sup> Moreover, according to one report, there were only 43 retail refueling stations nationwide as of mid-2020, with the vast majority of these in California,<sup>8</sup> and the capital cost of constructing these stations is high, amounting to approximately \$4 million.<sup>9</sup>

The attached model statutes seeks to address these issues. First, it would offer state rebates for the purchase of new HFCVs, which would be available for a ten year period. In addition, the model

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<sup>7</sup> <https://www.motortrend.com/cars/toyota/mirai/2021/2021-toyota-mirai-first-drive-review/>

<sup>8</sup> [https://afdc.energy.gov/fuels/hydrogen\\_stations.html](https://afdc.energy.gov/fuels/hydrogen_stations.html)

<sup>9</sup> M. Melaina and M. Penev, *Hydrogen Station Cost Estimates, Comparing Hydrogen Station Cost Calculator Estimates with other Recent Estimates*, National Renewable Energy Laboratory Tech Report NREL/TP-5400-56412, Sept. 2013. See also Jean Baronas, Gerhard Ahtelik, et al. 2018, *Joint Agency Staff Report on Assembly Bill 8: 2018 Annual Assessment of Time and Cost Needed to Attain 100 Hydrogen Refueling Stations in California*, California Energy Commission and California Air Resources Board Publication Number: CEC 600-2018-0008, at 74 (estimating the capital cost for a 400 kg station to be \$3.0 million.) Several auto industry experts and manufacturers believe that the absence of a network of fueling stations is one of the main deterrents to the wider adoption of HFCVs. <https://www.businessinsider.com/hydrogen-fuel-cell-cars-teslas-biggest-threat-2019-12>; <https://www.wardsauto.com/technology/costs-check-growth-fuel-infrastructure>; <https://www.bmw.com/en/innovation/how-hydrogen-fuel-cell-cars-work.html>

statute would provide state support for the development of a network of equitably located hydrogen refueling stations, with preference given to locations along heavily traveled corridors. The statute does not specify the amount of either the vehicle rebate or the network development subsidy, since the legislature of the enacting state is best suited to fix those amounts in light of the state's particular fiscal circumstances and sources of available funding.

Under the model statute, the state would fund the vehicle rebates and network development subsidies each year for ten years, devoting 4% of the state's gasoline excise tax, generally known as the Motor Fuels Tax, or its alternative fuels tax, to doing so. While enacting states may identify other sources of funding, the gasoline excise tax provides one logical funding source because all states impose such a tax, and HFCVs mitigate the harms and health risks associated with internal combustion engine vehicles. Although the statute does not include a provision that would extend the gasoline excise tax to the roadside sale of hydrogen fuel, it is assumed that the legislature may consider doing so in the event it were to subsidize the development of hydrogen refueling stations using the gasoline excise tax as a funding source.