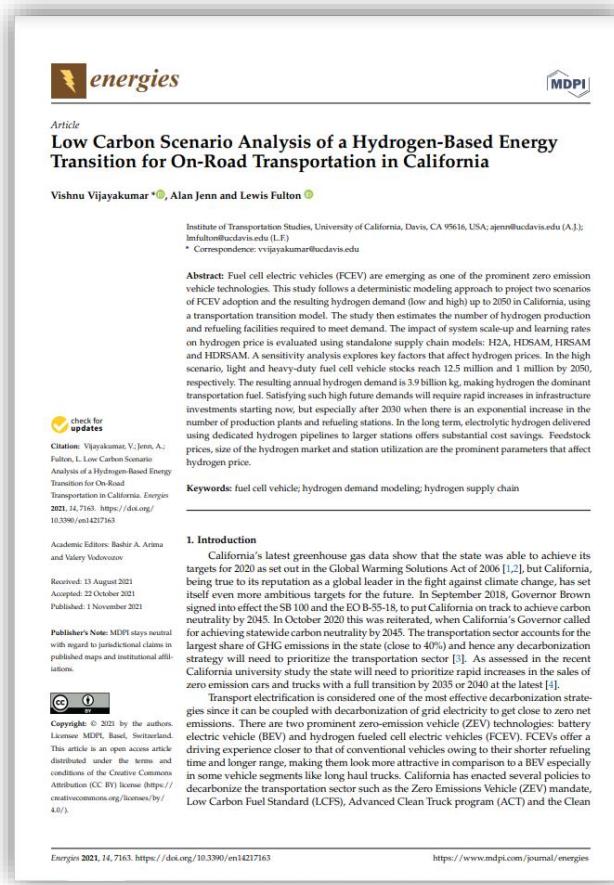


# Mary Nichols Environmental Policy Paper Award



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**Article**

**Low Carbon Scenario Analysis of a Hydrogen-Based Energy Transition for On-Road Transportation in California**

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**Abstract:** Fuel cell electric vehicles (FCEV) are emerging as one of the prominent zero emission vehicle technologies. This study follows a deterministic modeling approach to project two scenarios of FCEV adoption and the resulting hydrogen demand (low and high) up to 2050 in California, using a transportation transition model. The study then estimates the number of hydrogen production and refueling facilities required to meet demand. The impact of system scale-up and learning rates on hydrogen price is evaluated using standard supply chain models: H2A, H2SAM, H2SAM and H2SAM. A sensitivity analysis performs low and high price scenarios. In the high scenario, light and heavy-duty fuel cell vehicle stocks reach 12.5 million and 1 million by 2050, respectively. The resulting annual hydrogen demand is 3.9 billion kg, making hydrogen the dominant transportation fuel. Satisfying such high future demands will require rapid increases in infrastructure investments starting now, but especially after 2030 when there is an exponential increase in the number of production plants and refueling stations. In the long term, electric hydrogen delivered using dedicated hydrogen pipelines to larger stations offers substantial cost savings. Feedstock prices, size of the hydrogen market and station utilization are the prominent parameters that affect hydrogen price.

**Keywords:** fuel cell vehicle; hydrogen demand modeling; hydrogen supply chain

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2021 Recipient

**Vishnu Vijayakumar**

Named in honor of California Air Resources Board Chair and longtime ITS-Davis supporter, Mary Nichols, this award is given to the outstanding paper on environmental policy in transportation by UC Davis students.

Presented on behalf of UC Davis Institute of Transportation Studies for his paper:  
**"Low Carbon Scenario Analysis of a Hydrogen-Based Energy Transition for On-Road Transportation in California"**