##### September 1, 2021

**TO:** NAESB Board Strategy Committee

**RE:** U.S. Hydrogen Market

In June 2019, the International Energy Agency, at the request of the government of Japan under its G20 presidency, developed a report titled [The Future of Hydrogen](https://iea.blob.core.windows.net/assets/9e3a3493-b9a6-4b7d-b499-7ca48e357561/The_Future_of_Hydrogen.pdf) to analyze the current hydrogen market and offer guidance on its future development. The report found that there is an array of currently available technologies to produce and store hydrogen as well as means to transport hydrogen as a gas or liquid through pipelines or to utilize through the creation of electricity.

Per the U.S. Department of Energy, more than 9 million tons of hydrogen are produced every year within the United States. Although most hydrogen in the United States is produced using natural gas, alternative production methods are emerging, such as carbon capture and storage, water splitting (electrolysis) powered by nuclear or renewable energy sources, and biomass through biological processes. While primary use of hydrogen in the United States is in oil refining and ammonia production, emerging applications include use as a liquid fuel, heat generation, energy storage, and transportation. A recently completed [report](https://www.nrel.gov/docs/fy21osti/77610.pdf) by the National Renewable Energy Laboratory (NREL) estimates that by 2050, the demand for hydrogen in the United States could increase to 22 – 41 million metric tons per year and comprise between 4 – 17% of primary energy supplies. The report, in part, is based on projections of the incorporation of low concentrations of hydrogen into existing natural gas infrastructure and the use of hydrogen to provide seasonal energy storage for the electric grid.

Through the [Hydrogen Program Plan](https://www.hydrogen.energy.gov/pdfs/hydrogen-program-plan-2020.pdf), U.S. Department of Energy has recognized the value of hydrogen as part of a comprehensive energy portfolio that can enable energy security and resiliency while providing economic value and environmental benefits for diverse applications across multiple sectors. Identified key challenges by the U.S. Department of Energy for the utilization of hydrogen and related technologies include cost, reliability, and performance as well as the development and harmonizing of codes and standards. Currently, the U.S. Department of Energy has several projects underway focused on increasing hydrogen production and utilization. The [Energy Hydrogen Program](https://www.hydrogen.energy.gov/), which is coordinated through the Office of Energy Efficiency and Renewable Energy, Office of Fossil Energy, Office of Nuclear Energy, Office of Science, and Office of Electricity, conducts research and development in hydrogen production, delivery, infrastructure, storage, and fuel cells as well as multiple end uses across transportation, industrial, and stationary power applications. The program also includes activities to support technology validation, manufacturing, analysis, systems development and integration, safety, education, workforce development, and codes and standards.

The U.S. Department of Energy launched the [Hydrogen Shot](https://www.energy.gov/eere/fuelcells/hydrogen-shot) as part of its broader Energy Earthshots Initiative which aims to accelerate breakthroughs of more abundant, affordable, and reliable clean energy solutions by 2030. The goal of the Hydrogen Shot is to reduce the cost of clean hydrogen by 80% within a decade. Additionally, the Office of Energy Efficiency and Renewable Energy’s Hydrogen and Fuel Cell Technologies Office is undertaking the [H2@Scale Initiative](https://www.energy.gov/sites/default/files/2020/07/f76/hfto-h2-at-scale-handout-2020.pdf) to bring together stakeholders to advance affordable hydrogen production, transportation, storage, and utilization, in part to increase revenue opportunities across multiple energy sectors. This office is also working with the Office of Nuclear Energy and the Office of Electricity as part of the H2@Scale Initiative on integrating renewable generation into the electric grid using hydrogen as an energy storage medium.

As identified by the U.S. Department of Energy, the lack of standards is a major barrier to deploying hydrogen technologies. The Office of Energy Efficiency and Renewable Energy is working with groups such as standard development organizations and national laboratories to draft model standards, including those that address the distribution, storage, and utilization of hydrogen. While work under the Energy Hydrogen Program to date has been focused primarily on the need for uniform technical codes and standards, as the integration of hydrogen technologies within the energy markets increase, there will likely be a growing need for commercial standards.