NUCLEAR INNOVATION ALLIANCE

The Role of Nuclear Energy in a Hydrogen Future

Hydrogen promises to be a versatile tool that can help us achieve a zero-carbon future and is the center of energy discussions across many economic sectors. It already plays an important role in our economy, but over 95% is produced by steam-methane reforming, which emits greenhouse gasses (GHGs).

	Transportation Applications	Chemicals and Industrial Applications	Stationary and Power Generation Applications	Integrated/Hybrid Energy Systems
Existing Growing Demands	• Material-Handling Equipment • Buses • Light-Duty Vehicles	• Oil Refining • Ammonia • Methanol	• Distrubuted Generation: Primary and Backup Power	• Renewable Grid Integration (with storage and other ancillary services)
Emerging Future Demands	• Medium-and Heavy-Duty Vehicles • Rail • Maritime • Aviation • Contruction Equipment	• Steel and Cement Manufacturing • Industrial Heat • Bio/Synthetic Fuels	• Reversible Fuel Cells • Hydrogen Combustion • Long-Duration Energy Storage	• Nuclear/Hydrogen Hybrids • Gas/Coal/Hydrogen Hybrids with CCUS • Hydrogen Blending

Existing & Emerging Demands for Hydrogen, Source: U.S. Department of Energy Hydrogen Plan (2020)
Note: CCUS refers to Carbon Capture, Utilization, and Storage

Hydrogen consumption is expected to grow from 90 Mt in 2020, to over 500 Mt by 2050 worldwide. While other non-carbon emitting sources can produce hydrogen through water electrolysis, hydrogen can also be produced by conventional and advanced nuclear reactors using low and high-temperature electrolysis (LTE and HTSE) methods. Due to nuclear energy's unique characteristics, like its high-operating capacity factor and low land requirement, nuclear energy can produce hydrogen more effectively and at a rate that can help meet the global demand of the future. There are several DOE sponsored projects under construction in the U.S. to demonstrate the advantage of producing hydrogen from nuclear energy in different ways. **DOE's nuclear-hydrogen demonstration projects include:**

- **Constellation will host a 1 MWe LTE demo at Nine Mile Point (NY) by 2023**
- **Energy Harbor will host a 1-2 MWe LTE demo at Davis Besse (OH) by 2023**
- **Arizona Public Service/Pinnacle West Hydrogen will co-host a 15-20 MWE LTE demo at Palo Verde (AZ) by 2024**
- **Xcel Energy will host a <1MWe HTSE demo at Prairie Island (MN) by 2024**

Other recent Federal Investment in developing nuclear-hydrogen projects include provisions in the Infrastructure Investment and Jobs Act (IIJA) and the Inflation Reduction Act (IRA):

IIJA: $8 billion for hydrogen hubs, including a dedicated nuclear-hydrogen demo hub

IRA: A ten-year Hydrogen PTC, with direct pay for the first five years

To achieve decarbonization across all economies, we will have to use every tool at our disposal, including hydrogen produced from conventional and advanced nuclear reactors. For more information about how nuclear energy can help decarbonize existing and future industries, please contact the Nuclear Innovation Alliance at vibarrajr@nuclearinnovationalliance.org.