

Moving Toward **A Diverse Energy Future**

*Sandia National Laboratories
Hydrogen and Fuel Cells Program*

www.crf.sandia.gov



Hydrogen and fuel cell technologies for vehicle, stationary, and portable power applications are critical for realizing a clean and secure energy future.

Sandia's Hydrogen Program supports the nation's energy strategy—helping to diversify America's energy sector and reduce our dependence on foreign oil through the advancement of hydrogen and fuel cell technologies.

“Advancing hydrogen and fuel cell technology is an important part of the Energy Department's efforts to support the President's all-of-the-above energy strategy, helping to diversify America's energy sector and reduce our dependence on foreign oil.”

– Energy Secretary Steven Chu, March 29, 2012



Overcoming technical barriers through R&D

Fuel cells

Sandia National Laboratories has world-class expertise in fuel cell membranes for both Polymer Electrolyte Membrane (PEM) and Alkaline Exchange Membrane (AEM) fuel cells. Sandia develops hydrocarbon-based membranes that outperform commercially available products with superior conductivity and chemical and thermal stability.

Low-carbon hydrogen production

Sandia is developing low-cost, efficient technologies to produce hydrogen from concentrated solar power using novel high-temperature thermochemical approaches. Sandia's comprehensive program focuses on innovative redox-materials and cutting-edge reactor design.

Advanced storage technologies

Sandia provides the science and engineering know-how for advanced vehicular and stationary storage technologies such as metal hydrides and other materials-based technologies.

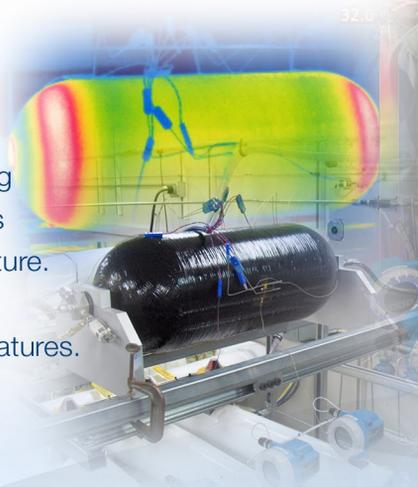
We offer unique expertise in geologic storage and provide production-to-demand systems analysis to advance the development of large-scale hydrogen storage solutions.

Hydrogen infrastructure innovation

Sandia provides specific science and engineering expertise in the high-pressure hydrogen systems that are required to create a hydrogen infrastructure. We advance the understanding of materials and components at operating pressures and temperatures.

Systems analysis

Sandia's robust systems analysis capability informs the research and development of hydrogen technologies through techno-economic modeling, resource assessments, and parametric tradeoff analyses.



Addressing safety issues and facilitating the development of codes and standards

Sandia leads the R&D efforts required for enhancing safety and developing codes and standards for hydrogen applications.

Effective codes & standards

Sandia removes technical barriers to the deployment of hydrogen technology by coordinating the engineering, research, and document development efforts of industry, labs, standards organizations, and regulators.

Enhanced safety of hydrogen installations

Sandia provides industry and other stakeholders with the tools and understanding to quantify and manage the risks of hydrogen fueling installations.

Hydrogen effects in materials

Sandia is a world leader in researching structural materials for pipelines, pressure vessels, and fuel system components. By applying unique high-pressure test equipment and analysis capabilities, we solve real-world challenges in the design, life prediction, and operation of hydrogen fueling components and systems.



Validating and demonstrating **of hydrogen and fuel cells** *in real-world conditions*

Sandia believes that laboratory innovations need to move quickly into the real-world environment to advance understanding and remove market barriers. We work directly with industry to deploy innovative hydrogen fueling systems and obtain critical feedback into the development process.

Partnering with **industry and academia**

The strength of Sandia's programs lies within its ongoing relationships with industry, labs, and academia.

Sandia's Hydrogen Program extensively partners with industry and is a member of the California Fuel Cell Partnership. Collaborating with Sandia is easily accomplished through a variety of established agreement mechanisms.



The Livermore Valley **Open Campus**



Sandia's Hydrogen Program is anchored in the Livermore Valley Open Campus (LVOC). The LVOC brings academia and industry together with researchers from Sandia and Lawrence Livermore National Laboratories to work on today's biggest science and engineering challenges. Collaborators can visit LVOC facilities for hours, days, weeks, or even months to work side by side with researchers at the national laboratories.

For more information, visit the Hydrogen section at www.crf.sandia.gov

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