

# ***RICHARD D. BOARDMAN***

*Ph.D. Chemical Engineering  
Idaho National Laboratory*



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Richard Boardman is a Directorate Fellow for the Idaho National Lab (INL) Technology Energy and Environmental Science & Technology Directorate. His current responsibilities include Pathway lead for the Light Water Reactor Sustainability Program - Flexible Plant Operation & Generation; National Technical Director for the DOE Nuclear Energy Integrated Energy Systems Program, and INL Laboratory Program Lead for the DOE Hydrogen and Fuel Cell Technology Office.

He graduated with a doctorate degree in Chemical Engineering from Brigham Young University, with an emphasis in energy and environmental applications. He was employed by Exxon Production Research and Geneva Steel before joining the Idaho National Laboratory in 1990.

## **Summary of Research Activities and Accomplishments:**

- **Hydrogen Production R&D:** He provides technical leadership for development and demonstration high temperature steam electrolysis and hydrogen conversion processes. He is a member of the International Gen-IV Information Forum-Hydrogen Production-Project Management Board.
- **Energy Systems Integration:** In 2007, Dr. Boardman began supporting an initiative to develop efficient energy systems that utilize nuclear energy for power generation and industrial heat applications. Referred to as hybrid energy systems, this concept can enable the build-out of variable generation renewable energy by providing flexible dispatch of the thermal energy produced by the nuclear reactor for load-following electricity demand, while maintaining a high capacity factor for nuclear plants by producing other industrial products when not in power generation mode. He helped start the DOE Big Idea referred to H<sub>2</sub>@Scale.
- **Combustion & Gasification of Coal and Biomass:** As a research member of the Advanced Combustion Engineering Research Center at Brigham Young University and the University of Utah, he gained broad education in combustion and fossil energy research topics, including comprehensive fluid dynamic combustion modeling, gas dynamics, measurement of char oxidation and pyrolysis kinetics, measurement of combustion behavior in coal combustors and oxygen-blown gasifiers, and pollutant formation kinetics and catalytic mechanisms analysis.
- **Radioactive Waste Processing Process Development:** Dr. Boardman's research activities at the Idaho National Lab began with the development of thermal treatment processes for solidifying radioactive wastes in a fluidized bed, followed by encapsulation in cement grouts or glass-ceramics created by isostatic pressing. This work led to development of a new process chemistry that was used to solidify over 1 million gallons of sodium-bearing radioactive waste. Working with the Australian Nuclear Science & Technology Organization, he also helped develop ceramic waste forms that permanently encapsulate transuranic elements.
- **Synthetic Fuels Process Design:** In 2002, Dr. Boardman organized a research team and began developing process models that have been used for front-end engineering design of coal-to-liquids and gas-to-liquids synfuels plants. In 2007 he testified before a U.S. congressional committee on the benefits and challenges of producing liquid fuels from coal. Subsequently, he has supported over 20 industry partners on projects involving gasification and combustion technology development and pilot plant testing.
- **Pollutant Control Technology Development:** Dr. Boardman has developed novel catalysis for NO<sub>x</sub> reduction with NH<sub>3</sub> and staged-combustion non-catalytic approaches. He developed and patented a concept for multi-pollutant abatement of NO<sub>x</sub>, SO<sub>x</sub>, and mercury using pulverized oil shale injected into the pulverized and fluidized-bed coal combustors. Additionally, he led the development of EPA

sample collection and analysis methods for radioactive gas (viz., volatile, semi-volatile, dioxins/furans, polychlorinated and bi-phenyl compounds, and metals) at the Idaho National Laboratory.

- **Academic Activities:** As a part-time faculty member for the University of Idaho and Brigham Young University since 1991, Dr. Boardman has mentored over 40 student interns and post doctors at the Idaho National Laboratory.
- **Awards:** Dr. Boardman was named the Idaho Academy of Science Distinguished Scientist/Engineer of the Year in 2004, In 2020 he was recognized in a DOE Secretary Achievement Award presented to the Integrated Energy Systems Team for efforts to establish nuclear hydrogen demonstration projects. Other awards include Laboratory Director Special Recognition in 2009 and 2015, Idaho National Laboratory; Federal Consortium for Technology Transfer Award in 2007 and 2008, In 2002, he was recognized by the DOE Assistant Secretary for Waste Management for significant contributions to the success of the DOE High Level Waste Program.
- **Technical Publications:** Dr. Boardman has authored over 70 citable technical articles and reports. He has three patents and copyrights for two software packages.