U.S. DEPARTMENT OF ENERGY | Office of NUCLEAR ENERGY

Front-End Engineering Designs (FEEDs) & Investigative Studies for Integrating Commercial Electrolysis Hydrogen Production with Selected Light Water Reactors

PI: Jeremy D. Ward, Westinghouse Electric Company, LLC

Pathway: Pathway 2 – Advanced Reactor Development Projects

Collaborators:
Westinghouse Electric Company – Nicola G. Arlia, Christen H. Verbofsky, Cory A. Stansbury, Arley W. Yorty, Steven D. Whaley, Paul V. Powers, Mark A. Moenssens, Louis W. Gaussa
Idaho National Laboratory – Dr. Tyler Westover, L. Todd Knighton

Abstract

Westinghouse Electric Company, LLC (Westinghouse) and its project partner, Idaho National Laboratory (INL), propose to significantly advance the evaluation of high-temperature steam electrolysis (HTSE) viability using solid-oxide electrolyzer cells (SOECs) for the purpose of commercial scale integration of hydrogen production into an existing light water reactor (LWR) nuclear power plant. Westinghouse will lead front-end engineering designs (FEEDs) development for nuclear-coupled hydrogen production at specific, multiple U.S. LWR plants. Designs will be developed for both pressurized water reactor (PWR) and boiling water reactor (BWR) technologies, at varying power levels ranging between 20MWe – 500MWe. Evaluations at larger capacities are needed to better understand impacts associated with integrated plants of this size, and to identify potential challenges to scale-up. Also, as both PWR and BWR designs are deployed across the U.S. nuclear fleet, evaluations using both are needed to understand the differences and create equitable opportunities for nuclear utilization beyond electricity generation.

In addition to the FEEDs being proposed, Westinghouse has chosen to include two special interest areas for investigative study. Westinghouse will also lead multiple licensing impact assessments for the designs developed during the FEEDs and investigative studies efforts.

While hydrogen generation creates additional flex-operating opportunities for nuclear plants, it also creates additional considerations for grid-interconnects and hydrogen end-users. The project will seek to resolve this challenge by demonstrating grid modernization data analysis and decision systems' ability to enable real-time power transactions with the grid.

The culmination of this program will be a techno-economic assessment (TEA), led by INL, which leverages their expertise and command of such analyses. In addition, a high-level life-cycle emissions assessment will be performed to evaluate the market potential and benefits of the process options and markets being considered. The objective of this task is to evaluate the business case for the flexible nuclear plant options developed by this project.

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