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

Scaled solid oxide co-electrolysis for low-cost syngas synthesis from nuclear energy

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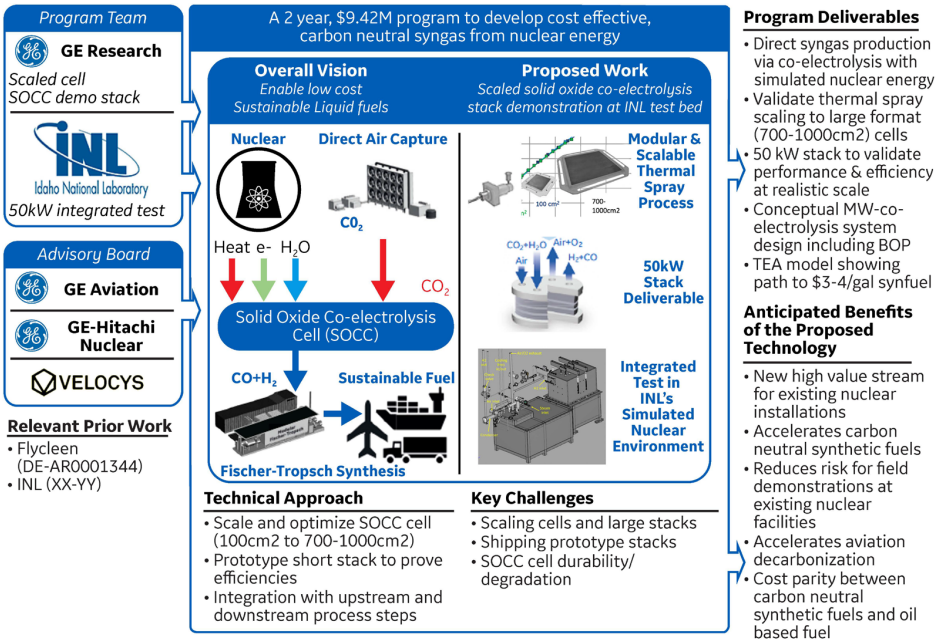
Pathway: Pathway 2, Advanced Reactor Development Projects.

Abstract

This project will complete key engineering design and demonstration tests to enable cost-competitive, carbon-neutral production of synthetic jet fuel and diesel using nuclear energy from existing light water reactors. The process consists of two key steps. First, solid oxide co-electrolysis (SOCC) technology developed at The GE Research Center (GRC) simultaneously converts carbon dioxide and steam into syngas (H2:CO) from nuclear heat and electricity. Second, a well-established downstream syngas-to-synfuel conversion process, such as Fischer-Tropsch synthesis, converts the syngas to liquid synfuel for a total projected cost of less than $4/gallon. In addition to developing the conceptual engineering design to couple a pressurized water reactor (PWR) to SOCC syngas plant, this project will demonstrate the new SOCC technology at 50 kW scale in preparation for a subsequent demonstration at 2-5 MW scale, potentially at a nuclear power plant. Specifically, the team will demonstrate operation of a 50 kW SOCC system at Idaho National Laboratory (INL) using simulated nuclear power to produce syngas at a cost that is expected to be ~30% lower than is possible via alternative renewable power-based approaches. The 50 kW demonstration will prove that high-efficiency syngas production can be achieved at low capital-cost using GRC's unique thermal-spray-based SOCC technology, as shown in Figure 1.



Summary Figure

Clean. Reliable. Nuclear.