

SOEC at Scale

Nuclear Hydrogen Initiatives (NHI)

This presentation by John Baily and Dan Czubik highlights NHI's strategic approach to building a sustainable and profitable hydrogen production industry using nuclear power coupled with Solid Oxide Electrolysis Cell (SOEC) Technology.

Business Proposition

Nuclear Hydrogen Initiatives (NHI) aims to leverage nuclear power for hydrogen production. The strategy focuses on optimizing existing energy generation technologies with advanced high-efficiency electrolyzers. This approach supports the regional hydrogen economy by utilizing existing pipeline infrastructure, enhancing grid security in Texas, and maintaining a realistic development timeline of 6-8 years. The target markets include heavy users in the Texas Gulf Coast region, aiming to transition from gray to pink hydrogen.

Energy and Production

The South Texas Project, an existing nuclear power station, will add a Westinghouse AP1000 reactor dedicated to hydrogen production. This setup provides consistent power and heat, operating 100% behind-the-meter. The project benefits from 45V tax credits and potentially the Clean Energy PTC. The solid oxide electrolysis process is planned to mature in size and efficiency. The water source will be the Gulf Coast Chicot aquifer, with on-site water treatment facilities.

Storage and Transportation

The hydrogen will be stored and transported via the existing Gulf Coast hydrogen pipeline network, supplemented by above-ground buffer tank storage. Grid power options and structured offtake agreements during the feasibility phase will ensure efficient distribution.

Financial Overview

The capital expenditure (CAPEX) includes \$5.3 billion for the Westinghouse AP1000 reactor, \$100 million for solid oxide electrolyzer banks, and \$75 million for pipeline tie-in. The operating expenditure (OPEX) is projected at \$220 million annually. Revenue generation is expected to reach \$816 million per year at \$6/kg of hydrogen, leading to significant profit margins once the initial investment is depreciated over the first decade.

Path to Profit

In the first ten years, the project anticipates a net profit of \$46 million annually, with operational costs at \$5.66 per kilogram of hydrogen produced. In the subsequent decade following return of capex, operational costs are expected to drop to \$1.62 per kilogram, increasing annual net profit to \$188 million. The first ten years will rely on the 45V tax credits. The second decade will operate without 45V tax credits.

