Alaska Applied Sciences, Inc. (AASI)

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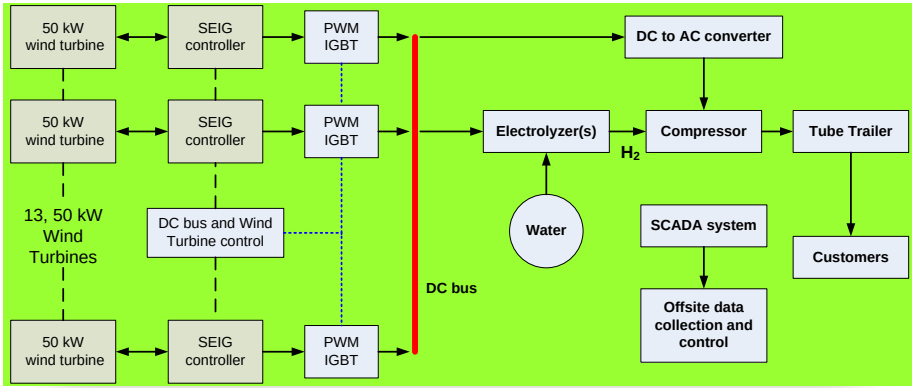
Low-cost Hydrogen fuel production from "distributed" wind via SEIG and close-coupled electrolysis stacks

Company Summary

Founded 1990. Bill Leighty, Principal. 25 years small 13-turbine Palm Springs windplant design, maintenance, operation. **Self Excited Induction Generator (SEIG)** concept demo on one turbine. Energy consulting. 15 years, coauthor for nonprofits, research papers on renewable energy (RE)-to-H_2 and to -NH_3 lower-cost alternatives to electricity systems for RE transmission, storage, integration. ARPA-E 2015 "OPEN" FOA Full Application for similar project; not selected.

Problem Statement

Wind turbines and plants are now built to deliver grid-quality electricity. Hydrogen (H_2) and Ammonia (NH_3) fuels will be a bigger market than the grid by 2050: we must now also optimize wind turbines and plants for lower capex and O&M, low H_2 and NH_3 fuel costs. SEIG and close-coupling electrolysis stacks to the windplant "wild DC" bus enables and simplifies "distributed" wind, without grid connection. Need unique NREL capability: invent, test; then on windplant.



Multiple SEIG-mode turbines feed common "wild DC" bus, impedance-matched directly to the electrolysis stacks, eliminating the "transformer-rectified" system. Integrating turbine + windplant + electrolysis controls also lowers H2 fuel cost. Long-term test and demo on an operating 13-turbine Palm Springs windplant.

Requested National Lab

NREL: SEIG, wind-to-H_2, "distributed" wind SNL: "distributed" wind

Background Information

Prior Lab Relationships: DE-FG36-03GO13140 $70,000
www.osti.gov/servlets/purl/859303-oXetpM/

Potential Work Scope & Deliverables

Task 1	• Design SEIG system at NREL: power electronics, controls; lab test • Deploy at Palm Springs windplant: test, verify, modify, retest
Task 2	• Design close-coupling electrolysis stacks to windplant DC bus at NREL using AASI's ProtonOnsite H6m components; lab test • Deploy complete SEIG close-coupled H_2 system at Palm Springs windplant: test, modify, optimize, verify, cost estimate. Sell H_2

Technology / Project Impact

DOE RFI "H2@SCALE" will require "distributed" wind and solar plants dedicated to H_2 and NH_3 fuel production, without grid connection, via new pipelines, over vast new, remote, land areas, at lower fuel cost than via today's grid–delivery systems.

SEIG allows turbines with low-cost, simple, reliable induction motors as generators.

Close-coupling electrolysis stacks to the windplant multi-turbine DC bus eliminates redundant transformer-rectifier and controls, in integrated, optimized system, for ~25% lower capex and O&M costs, ~ 20% lower H_2 and NH_3 fuels cost, plus low transmission, storage, and delivery costs, for RE-source transport and CHP energy.

Enables meeting State of CA RPS and "80 in 50" goals in 2050, where H_2 + NH_3 fuels will require more renewable, CO2-emission-free energy than the grid.