Resilient EMP-Hardened Offshore Wind and OTEC Powered Grids for Subsea Renewable Electricity and Hydrogen Production

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Abstract
GTA is an early-stage prototype R&D engineering company focused on development of resilient, EMP-hardened gigawatt scale subsea hydrogen grids for large-scale energy storage, grid balancing, and renewable fuels and chemicals production. GTA's innovation is development of pressure-balanced electrolyzers, fabricated from abundant commodity materials, that are anchored at the seafloor. The techno-economic advantages of seafloor hydrogen production and storage include: (i) first-stage compression without a mechanical compressor; (ii) ambient cold-water cooling; (iii) fail-safe operation in subfreezing weather; (iv) no alterations to existing codes, regulations, and best practices for offshore wind and ocean energy conversion systems; (v) absence of combustible oxygen for safe hydrogen production and storage, (vi) shielding from EMP and harsh weather events, and more. An illustrative example for the maritime shipping industry's goal for large-scale reduction in carbon intensity, SOx, NOx, and particulate matter emissions will be discussed. A second example, the role of subsea hydrogen production and storage for underwater data centers such as Microsoft's Project Natick, will also be presented. Electrolysis of water is a low-voltage, high current electrochemical process. The relationship between available marine power sources, including marine nuclear reactors, and electrolyzer stack configurations will be discussed.

Abridged Biography
Elias Greenbaum is President of GTA, Inc., a company whose mission is applying offshore wind and ocean energy to power gigawatt-scale subsea green hydrogen production. He is a member of the Board of Directors, California Hydrogen Business Council. He is a founding member of the Green Hydrogen Working Group, Business Network for Offshore Wind. He has held research, academic, and industrial positions at the University of Illinois, Urbana-Champaign, the University of Tennessee, Knoxville, the Rockefeller University, and the Union Carbide Corporate Research Laboratory. He is a fellow of the American Physical Society and the American Association for the Advancement of Science. He is a former staff member and group leader in the Chemical Technology/Chemical Sciences Divisions at Oak Ridge National Laboratory and received the ORNL 2000 Scientist of the Year award. He is a UT-Battelle Corporate Fellow and a UT-Battelle Distinguished Inventor. He received a PhD in physics from Columbia University.