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The viability of renewable energy and energy storage for the provision of power for desalination

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This research investigates the viability of renewable energy and energy storage to meet a significant and fundamental human need (in this case, large-scale drinking water supplies) unassisted by conventional power. The use of renewable energy to power reverse osmosis desalination plants to provide potable water for around 50,000 people in Newhaven, in South East England, and in Massawa in Eritrea, was investigated. The following energy sources, in a variety of combinations were specifically assessed: wind power, wave power, solar power, tidal current power, and hydrogen production, storage and use in fuel cells. The following types of reverse osmosis plants were studied: 1. No Brine Stream Recovery (BSR) reverse osmosis plant; 2. Pelton Wheel BSR reverse osmosis plant; 3. Pressure Exchanger BSR reverse osmosis plant. Modelling was conducted to derive the amount of water that each reverse osmosis plant would deliver from various combinations and amounts of renewable power input, at varying feedwater temperatures. The cost of the scenarios that were able to meet the users' water demands were compared with the costs associated with the equivalent conventionally-powered scenario over a 25-year life. Specifically, the following were considered: A coal-fired plant with carbon capture and storage (CCS) at Newhaven and A diesel generator at Massawa. This comparison was made with and without the external costs associated with conventional energy production and use. A comparison of the most financially-attractive renewable energy option and the equivalent conventionally-powered scenario at Massawa was undertaken, based on Net Present Value (NPV) methodology.

Biography

Cliff Dansoh is a Chartered PhD qualified Engineer with over 30 years' experience in multi discipline industrial environments. He is currently a Senior Lecturer in Renewable Energy Technologies at Kingston University in London and his subject areas of interest include biomass and biofuels, fuel cells and hydrogen, wind and solar power and ocean energy systems, such as wave and tidal power. Before entering academia in 2016, he worked in a variety of roles where he gained extensive engineering experience in the maritime environment, and of managing maritime operations, combined with ten years' risk management experience within large transportation infrastructure projects.

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