

Seminar

Levelized cost of hydrogen produced via solar- and wind-powered electrolysis in the Philippines

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| Speaker | Assoc. Prof. Dr. PARAGGUA, Julie Anne D.R., U. of the Philippines Diliman |
| Moderator | Dr. Artur Braun, Empa Dübendorf, Laboratory for High Performance Ceramics |
| Audience | open to everybody |
| Date | Tuesday, February 13, 2024, 16:00 – 16:30 |
| Venue | Empa, Dübendorf, Ceramics Building KE 026 |

Abstract

Hydrogen produced via electrolysis from renewable energy sources is a promising clean and efficient energy vector with its high energy density and near zero-greenhouse gas emissions. Although the renewable energy potential of the Philippines is well explored, the feasibility of green hydrogen production in the Philippines using solar and wind power is unknown. This study aims to evaluate the levelized cost of hydrogen (LCOH) produced from solar and wind power. LCOH calculations were done for every province, using the locations where annual average solar global horizontal irradiance (GHI) and wind speed are highest. The net present cost (NPC) of solar- and wind-powered electrolysis plants with deionized water as feedstock were computed using ISLA, an in-house microgrid modeling software. The total power generation and the energy-to-hydrogen conversion efficiency of the electrolyzers along with the NPC dictate the LCOH. Heatmaps for each renewable resource and for each electrolyzer type were generated. Additionally, Monte Carlo simulations were performed for provinces with the lowest, average, and highest LCOH values according to different distributions that describe the variation in the capital and operating expenses, discount rate, and price of water. LCOH values for solar-powered systems have a narrower range compared to wind-powered systems as sunlight is generally more available to harness, evidenced by the capacity factors attained by the systems. Furthermore, locations where capacity factor is high also have narrower LCOH distributions from the uncertainty analysis – implying less economic risks in these locations. Few locations yielded an LCOH of less than 2.0 USD/kg H₂ that demonstrates the need for economic policy instruments that incentivize the development of green hydrogen plants.

Biography

Julie Anne del Rosario Paraggua is an Associate Professor and the current chair of the Department of Chemical Engineering in the University of the Philippines Diliman. She finished her Master's degree in Environmental Science and Engineering from the Gwangju Institute of Science and Technology in South Korea and finished her Doctor of Philosophy degree in Chemical Engineering from the University of the Philippines Diliman. She is a co-founder of the Laboratory of Electrochemical Engineering, in which she works on research focusing on developing energy storage and conversion technologies, synthesis and characterization of electrodes, electrolyte and electrocatalysts for batteries, electrolyzers, and fuel cells. She currently leads a project under the Advanced Batteries Center funded by the Department of Science and Technology's Niche Centers in the Regions (NICER) for R&D.