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Financial feasibility study of a 100 Mw Green hydrogen and ammonia plant, case study of the proposed plant at Olkaria Geothermal Field, Kenya

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ABSTRACT

Globally, steps towards achievement of a carbon free ammonia industry are being driven by decarbonizing the large, already existing ammonia supply chain, currently estimated at 180 million tons per year, as well as production of fertilizer, a key component for agriculture. Agriculture is Kenya´s economic backbone, contributing approximately 33 percent of Kenya's Gross Domestic Product (GDP). Guided by the Paris Agreement on climate change, global energy systems must undergo a significant transformation from one largely based on fossil fuels to an efficient and renewable low-carbon energy system. KenGen, in line with her zero-carbon emission energy generation strategy, continues to scale up electricity production from renewable sources, mainly geothermal. The company plans to develop a 100 MW green hydrogen plant that will make use of geothermal energy to produce green ammonia for industrial applications and manufacture of fertilizers for agricultural use in the region. This paper seeks to study and analyze the technical and financial viability of a 100 Mw green hydrogen electrolysis plant for synthesis of ammonia for commercial industrial application at Olkaria Geothermal Field, Kenya. The study assesses possibilities of generating green hydrogen from geothermal resources, through electrolysis for synthesis of ammonia. A thirty-year financial and economic model will be developed using capital budgeting techniques, based on literature review, assumptions and relevant data sets of the project and the project area. To show possible effects of uncertainty on the financial feasibility of the project, sensitivity analysis method will be used to estimate how changes in input data will affect the outcome of the financial feasibility assessment. Results will indicate the financial viability of the project, recommend best alternatives for key project variables and give insights of project risk associated with changes in input parameters.