

# Analisa Tekno-Ekonomi Green Hydrogen Plant dengan Pemanfaatan Excess Power dari Floating Solar Photovoltaic Waduk Cirata = Techno-Economic Analysis of Green Hydrogen Plant by Utilizing Excess Power from Floating Solar Photovoltaic Cirata Reservoir

Wildan Baina Iedai El Islami, author

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## Abstrak

Pengembangan terhadap energi hidrogen tengah tumbuh pesat belakangan ini karena sumber energi hijau menjadi jauh lebih penting di berbagai industri dan mampu menggantikan natural gas dimasa mendatang. Negara - negara di berbagai belahan dunia telah mulai mengembangkan energi hidrogen secara masif seperti Jepang, Korea, Italia, Spanyol, Arab Saudi, Cina, Turki dan Maroko dengan metoda elektrolisis dari sumber energi terbarukan dengan biaya produksi yang cukup kompetitif. Biaya produksi hidrogen yang telah dikembangkan dengan metoda elektrolisis ini di Turki USD 3,1 \$/kgH<sub>2</sub>, Korea Selatan USD 7,72 \$/kgH<sub>2</sub>, Italy 6,9 €/kgH<sub>2</sub>, Arab Saudi 43,1 \$/kgH<sub>2</sub> dan Maroko 4,99 \$/kgH<sub>2</sub>. Oleh karena itu, diperlukan penelitian pengembangan produksi green hydrogen di Indonesia dengan metoda elektrolisis dari floating solar photovoltaic di Waduk Cirata. Metoda penelitian dimulai dengan pemilihan teknologi green hydrogen plant dengan membandingkan spesifikasi elektroliser yang tersedia dipasaran melalui skema "scoring".

Selanjutnya dilakukan analisa keekonomian melalui tiga skema excess power yaitu 20%, 30% dan 40% dari energi listrik yang tersedia pada floating solar photovoltaic. Analisa keekonomian dilakukan dengan menghitung nilai Net Present Value (NPV), Internal Rate Return (IRR) dan Payback Period. Teknologi yang dipilih berdasarkan hasil scoring adalah PEM Electroliser dengan nilai scoring 8,32. Analisa keekonomian pengembangan green hydrogen plant yang paling optimum adalah skema excess power 40% dengan nilai NPV sebesar USD 74.152.302, IRR 18,92% dan Payback Period selama 4,76 tahun (4 tahun 10 bulan).

.....The development of hydrogen energy is growing rapidly in recent years as green energy sources have become much more important in various industries and can replace natural gas in the future. Countries in various parts of the world have started to develop hydrogen energy massively such as Japan, Korea, Italy, Spain, Saudi Arabia, China, Turkey and Morocco by using electrolysis method to produce hydrogen from renewable energy sources with competitive production costs. The cost of producing hydrogen which has been developed by the electrolysis method in Turkey USD 3.1 \$/kgH<sub>2</sub>, South Korea USD 7.72 \$/kgH<sub>2</sub>, Italy 6.9 €/kgH<sub>2</sub>, Saudi Arabia 43.1 \$/kgH<sub>2</sub> and Morocco 4.99 \$/ kgH<sub>2</sub>. Therefore, it is necessary to research the development of green hydrogen production in Indonesia using the electrolysis method from floating solar photovoltaic in the Cirata Reservoir. The research method was carried out by selecting green hydrogen plant technology by comparing the specifications of the electrolyzer available in the market through a "scoring" scheme. Furthermore, an economic analysis is carried out through three excess power schemes, namely 20%, 30% and 40% of the electrical energy available in floating solar photovoltaic. Economic analysis is done by calculating the value of Net Present Value (NPV), Internal Rate Return (IRR) and Payback Period. The technology chosen based on the scoring results is PEM Electroliser with a scoring value of 8.32. The most optimum economic analysis of green hydrogen plant development is the 40% excess power scheme with an NPV value of USD 74,152,302, IRR 18.92% and a Payback Period of 4.76 years (4 years 10 months).