

## ABSTRAK

Zuhwan Asbah. Kajian Kelayakan Investasi Proyek PLTA Watunohu di Kolaka.  
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Pembangunan Pembangkit Listrik Tenaga Air (PLTA) tipe *run of river* merupakan strategi penting dalam mendukung transisi energi rendah emisi di Indonesia. Penelitian ini bertujuan menilai kelayakan investasi Proyek PLTA Watunohu di Kolaka melalui evaluasi teknis dan finansial, dengan penekanan pada interpretasi hidrologi dan optimasi debit desain yang memanfaatkan data *Flow Duration Curve* (FDC) dari *Feasibility Study* (FS) terdahulu. Analisis teknis mencakup interpretasi kondisi hidrologi sungai, pemanfaatan data FDC sebagai dasar penyusunan alternatif debit, serta optimasi debit rencana untuk memperoleh debit desain yang paling optimal dalam menghasilkan energi tahunan dan faktor kapasitas pembangkit yang representatif, sementara parameter teknis lainnya mengacu pada hasil FS untuk menjaga konsistensi desain. Evaluasi finansial dilakukan menggunakan indikator *Net Present Value* (NPV), *Internal Rate of Return* (IRR), *Profitability Index* (PI), dan *Payback Period* (PP) pada skenario dasar serta skenario integrasi mekanisme perdagangan karbon Article 6 Perjanjian Paris. Hasil penelitian menunjukkan bahwa proyek layak secara finansial pada skenario dasar dengan NPV Rp247,97 miliar, IRR 8,19%, PI 1,70, dan PP 10,53 tahun, sedangkan integrasi Article 6 meningkatkan kinerja finansial dengan NPV Rp261,79 miliar, IRR 8,27%, PI 1,71, dan PP 10,43 tahun. Analisis sensitivitas menunjukkan bahwa kelayakan finansial PLTA Watunohu relatif stabil terhadap perubahan biaya investasi, faktor kapasitas pembangkit, dan kurs Rupiah, di mana pada seluruh skenario variasi  $\pm 20\%$  proyek tetap layak dengan NPV positif, IRR di atas WACC,  $PI > 1$ , serta periode pengembalian yang masih dapat diterima. Sensitivitas tertinggi terdapat pada kenaikan CAPEX dan pelemahan nilai tukar, sehingga pengendalian biaya dan mitigasi risiko kurs menjadi faktor kunci keberlanjutan finansial proyek. Secara umum, PLTA Watunohu dinilai layak secara finansial dan berperan strategis dalam mendukung ketahanan energi, pengurangan emisi karbon, serta pencapaian target *Net Zero Emissions* Indonesia tahun 2060.

**Kata kunci:** *Article 6* Perjanjian Paris, debit desain, *Flow Duration Curve*, kelayakan teknis, kelayakan finansial

## ABSTRACT

Zuhwan Asbah. Investment Feasibility Study of the Watunohu Hydropower Project  
in Kolaka

Supervised by Prof. Dr. Dr. Aminullah Assagaf, SE., MS., MM.,M.Ak.

The development of run-of-river hydropower plants represents an important strategy in supporting Indonesia's low-carbon energy transition. This study aims to assess the investment feasibility of the Watunohu Hydropower Project in Kolaka through technical and financial evaluations, with emphasis on hydrological interpretation and design discharge optimization using Flow Duration Curve (FDC) data derived from a previous Feasibility Study (FS). The technical assessment includes interpretation of river hydrological conditions, utilization of existing FDC data as the basis for defining alternative discharges, and optimization of the design discharge to obtain the most optimal configuration in terms of representative annual energy production and power plant capacity factor, while other technical parameters follow the FS results to maintain design consistency. Financial evaluation is conducted using Net Present Value (NPV), Internal Rate of Return (IRR), Profitability Index (PI), and Payback Period (PP) under a base-case scenario and a scenario incorporating carbon trading mechanisms under Article 6 of the Paris Agreement. The results indicate that the project is financially feasible under the base scenario, with an NPV of IDR 247.97 billion, an IRR of 8.19%, a PI of 1.70, and a PP of 10.53 years, while the integration of Article 6 improves financial performance, increasing the NPV to IDR 261.79 billion, the IRR to 8.27%, the PI to 1.71, and reducing the PP to 10.43 years. Sensitivity analysis shows that the financial feasibility of the Watunohu Hydropower Project remains relatively stable against variations in investment cost, capacity factor, and exchange rate, where under all  $\pm 20\%$  variation scenarios the project remains feasible with a positive NPV, IRR above the weighted average cost of capital, PI greater than one, and an acceptable payback period. The highest sensitivity is observed in capital expenditure increases and exchange rate depreciation, indicating that cost control and exchange rate risk mitigation are key factors for the project's financial sustainability. Overall, the Watunohu Hydropower Project is financially feasible and strategically important in supporting energy security, carbon emission reduction, and Indonesia's Net Zero Emissions target by 2060.

**Keywords:** design discharge, financial feasibility, Flow Duration Curve, Paris Agreement Article 6, technical feasibility