UNIVERSITAS GADJAH MADA
Analisis Resiliensi Energi Di Pembangkit Listrik Tenaga Mikrohidro (PLTMH) Kedungrong, Kabupaten Kulon Progo, Yogyakarta
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INTISARI

ANALISIS RESILIENSI ENERGI DI PEMBANGKIT LISTRIK TENAGA MIKROHIDRO (PLTMH) KEDUNGRONG, KABUPATEN KULON PROGO, YOGYAKARTA

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PLTMH Kedungrong di Kabupaten Kulon Progo telah beroperasi sejak tahun 2012 dan melayani 46 rumah tangga. Meskipun masih berfungsi sebagai sistem energi komunitas, PLTMH Kedungrong menghadapi tantangan teknis, sosial, kelembagaan, dan finansial yang dapat mempengaruhi keberlanjutan operasionalnya. Penelitian ini bertujuan menganalisis ancaman, dampak, kerentanan, profil risiko, dan kapasitas resiliensi energi PLTMH Kedungrong, serta merumuskan strategi intervensi prioritas menggunakan kerangka *ASEAN Energy Resilience Assessment* (ERA). Kerangka ERA digunakan karena mampu mengintegrasikan penilaian risiko teknis, sosial, ekonomi, dan kelembagaan melalui penilaian individual pra-FGD dan validasi deliberatif melalui *Focus Group Discussion* (FGD). Penelitian dilakukan melalui observasi lapangan, wawancara semi-terstruktur, penilaian individual pra-FGD, dan FGD yang melibatkan KMTI, masyarakat/Dukuh Kedungrong, Dinas ESDM DIY, dan akademisi. Nilai probabilitas ancaman dan keparahan kerentanan dari tahap pra-FGD digunakan dalam penyusunan matriks risiko, sedangkan FGD digunakan untuk memvalidasi relevansi variabel dan menetapkan risiko prioritas. Hasil penelitian menunjukkan bahwa debit aktual sebesar 0,32 m^3/detik masih berada di atas ambang kritis operasional, sehingga strategi prioritas tidak diarahkan pada peningkatan debit, melainkan pada penguatan kontrol beban, proteksi intake, dan kapasitas finansial. Matriks risiko final menghasilkan tiga risiko prioritas dengan skor 69,19-70,83, yaitu fluktuasi beban dan tekanan operasional berlebih, sampah pada intake, serta keterbatasan dana operasional. Strategi intervensi yang direkomendasikan meliputi transisi IGC ke ELC, penerapan PSMP berbentuk elemen lengkung cekung berpenampang C untuk mengarahkan debris tanpa menutup aliran bawah, serta pengembangan PLTMH Kedungrong sebagai Desa Wisata Energi Mandiri guna memperkuat pendapatan non-iuran tanpa menambah beban masyarakat pengguna.

Kata kunci: *ASEAN Energy Resilience Assessment* (ERA), Desa Wisata Energi Mandiri, matriks risiko, PLTMH komunitas, resiliensi energi.

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ABSTRACT

ENERGY RESILIENCE ANALYSIS OF THE KEDUNGRONG MICRO-HYDRO POWER PLANT (MHPP), KULON PROGO REGENCY, YOGYAKARTA

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The Kedungrong Micro-Hydro Power Plant (MHPP) in Kulon Progo Regency has been operating since 2012 and currently serves 46 households. Although it continues to function as a community-based energy system, the Kedungrong MHPP faces technical, social, institutional, and financial challenges that may affect its long-term operational sustainability. This study aims to analyse threats, impacts, vulnerabilities, risk profiles, and energy resilience capacity of the Kedungrong MHPP, as well as to formulate priority intervention strategies using the ASEAN Energy Resilience Assessment (ERA) framework. The ERA framework was applied because it integrates technical, social, economic, and institutional risk assessment through individual pre-FGD assessment and deliberative validation in a Focus Group Discussion (FGD). The study was conducted through field observation, semi-structured interviews, individual pre-FGD assessment, and FGD involving KMTI, the local community/Dukuh Kedungrong, the Yogyakarta Special Region Energy and Mineral Resources Office, and academics. Threat probability and vulnerability severity scores obtained from the pre-FGD stage were used to construct the risk matrix, while the FGD was used to validate variable relevance and determine priority risks. The results show that the current flow discharge of 0.32 m^3/s remains above the critical operational threshold. Therefore, the priority strategies are not directed toward increasing water discharge, but toward strengthening load control, intake protection, and financial capacity. The final risk matrix identified three priority risks with scores ranging from 69.19 to 70.83: excessive load fluctuation and operational pressure, debris accumulation at the intake, and limited operational funding. The recommended interventions include the transition from IGC to ELC, the implementation of a C-shaped concave Passive Mechanical Debris Deflector (PSMP) to divert debris without blocking lower water flow, and the development of the Kedungrong MHPP as an Independent Energy Tourism Village to strengthen non-tariff income without increasing the financial burden on household users.

Keywords: *ASEAN Energy Resilience Assessment, community micro-hydro power plant, energy resilience, Independent Energy Tourism Village, risk matrix.*