

INTISARI

Penelitian ini bertujuan untuk menentukan jenis biomassa paling potensial yang dapat digunakan dalam program *cofiring* di PLTU Punagaya Jeneponto, Sulawesi Selatan, sebagai salah satu upaya transisi energi menuju pengurangan emisi karbon dan optimalisasi energi terbarukan. Mengingat kondisi operasional dan pasokan biomassa yang beragam, dibutuhkan metode pengambilan keputusan yang mampu mengakomodasi berbagai kriteria teknis, ekonomi, logistik, lingkungan, dan sosial. Oleh karena itu, penelitian ini menggunakan pendekatan Fuzzy Analytical Hierarchy Process (Fuzzy AHP) untuk pembobotan kriteria dan sub-kriteria, serta Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) untuk perankingan alternatif biomassa. Data primer diperoleh melalui wawancara dan penyebaran kuesioner kepada pemangku kepentingan terkait, seperti manajemen PLTU, penyedia biomassa, dan pemerintah daerah. Sementara itu, data sekunder diperoleh dari laporan teknis, studi pustaka, dan hasil uji kualitas biomassa. Alternatif biomassa yang dianalisis mencakup bonggol jagung, sekam padi, woodchips, serbuk kayu (sawdust), sabut kelapa, dan ampas tebu. Kriteria evaluasi dibagi menjadi lima aspek utama: operasi (total moisture, ash content, calorific value), supply chain (ketersediaan lokal, kontinuitas pasokan, jarak lokasi), ekonomi (harga dan biaya penanganan), lingkungan (emisi CO₂, SO_x, NO_x), dan sosial (penerimaan masyarakat, lapangan kerja lokal). Hasil penelitian menunjukkan bahwa sub-kriteria *calorific value*, *emisi CO₂*, dan *harga biomassa* merupakan faktor yang paling menentukan dalam pemilihan biomassa. Melalui perhitungan TOPSIS, alternatif woodchips menempati peringkat tertinggi dengan skor 0,75, diikuti oleh bonggol jagung (0,63) dan sawdust (0,47). Woodchips unggul karena memiliki nilai kalor tinggi, kadar abu rendah, serta pasokan yang relatif stabil dari wilayah sekitar. Dengan pendekatan terstruktur dan berbasis data ini, diharapkan hasil penelitian dapat menjadi dasar perencanaan strategi energi berkelanjutan di PLTU serupa.

Kata kunci: *cofiring*, biomassa, PLTU, Fuzzy AHP, TOPSIS

This study aims to determine the most potential type of biomass that can be used in the cofiring program at the Punagaya Jeneponto Power Plant, South Sulawesi, as one of the energy transition efforts towards reducing carbon emissions and optimizing renewable energy. Given the diverse operational and supply conditions of biomass, decision-making methods are needed that are able to accommodate a variety of technical, economic, logistical, environmental, and social criteria. Therefore, this study uses the Fuzzy Analytical Hierarchy Process (Fuzzy AHP) approach for weighting criteria and sub-criteria, as well as the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) for biomass alternative ranking. Primary data was obtained through interviews and the distribution of questionnaires to relevant stakeholders, such as coal-fired power plant management, biomass providers, and local governments. Meanwhile, secondary data were obtained from technical reports, literature studies, and biomass quality test results. Biomass alternatives analyzed included corn cobs, rice husks, woodchips, sawdust, coconut coir, and bagasse. The evaluation criteria were divided into five main aspects: operations (total moisture, ash content, calorific value), supply chain (local availability, continuity of supply, location distance), economic (handling prices and costs), environmental (CO₂, SO_x, NO_x emissions), and social (community revenue, local employment). The results show that the sub-criteria of calorific value, CO₂ emissions, and biomass price are the most decisive factors in biomass selection. Through TOPSIS calculations, alternative woodchips ranked highest with a score of 0.75, followed by corn cobs (0.63) and sawdust (0.47). Woodchips excel because they have a high calorific value, low ash content, and a relatively stable supply from the surrounding area. With this structured and data-based approach, the results of the research can be the basis for planning sustainable energy strategies at similar coal-fired power plants.

Keywords: cofiring, biomass, coal-fired power plants, Fuzzy AHP, TOPSIS