1. Background

Indonesia has strengthened its energy-transition framework in line with the Net Zero Emissions (NZE) 2060 objective and the Sustainable Development Goals (SDGs) 2030. Government Regulation No. 40 of 2025 on the National Energy Policy (Kebijakan Energi Nasional/KEN), which revoked Government Regulation No. 79 of 2014, sets a 19–23% target for the share of new and renewable energy in primary energy supply by 2030 [1]. For the power sector, PLN reported that biomass co-firing had been implemented at 47 CFPPs during 2024 and plans to expand the program to 52 CFPPs in 2025, with projected biomass demand of 10.2 million tons per year [2]. Biomass used in the program includes agricultural, plantation, and forestry residues. Meeting the planned scale therefore requires diversification of feedstocks and reliable local supply chains.

Recent co-firing literature emphasizes that biomass properties vary substantially by feedstock and that moisture, ash, volatile matter, calorific value, and ash chemistry can affect combustion behavior and the operational adjustments required in existing coal-fired boilers [3]. In Indonesia, agricultural, plantation, and forestry residues are already being used in PLN's co-firing program [2]. This diversity creates an opportunity to utilize locally available residues that are currently underused, while feedstock quality and supply-chain reliability must be assessed before large-scale deployment.

Local economic participation is also relevant to the SDGs because renewable-energy supply chains can create local value and employment when procurement, skills development, and community participation are incorporated into project design [9]. Ciamis Regency in West Java illustrates the local-development context; the percentage of people living in poverty was 7.42% in 2023 according to BPS Kabupaten Ciamis [6]. This condition reinforces the importance of evaluating whether locally available resources, such as sugar palm waste, can generate both energy and socio-economic value.

The local economy in Ciamis is predominantly driven by farming, fisheries, and micro, small, and medium enterprises (MSMEs), particularly in the food and beverage sector. However, limited access to resources and energy constraints continue to hinder growth. Utilizing sugar palm waste as biomass fuel for co-firing in coal-fired power plants presents an innovative opportunity to not only address energy challenges but also create new economic value for these industries. Such initiatives align with Indonesia's commitment to the SDGs by empowering communities, reducing poverty, fostering cleaner energy practices, and strengthening local economic resilience.

Thus, to meet the gap of Indonesia's achievement to NZE 2060 and SDGs 2030 through co- firing program initiated by PT PLN (Persero), scope of work from this study are included: 1) Feedstock and Supply Chain Assessment, to analyse availability, sustainability and accessibility of the biomass feedstock and suitable markets including technology selection for biomass processing; and 2) Environmental, Social and Governance (ESG) Impacts, to analyse the reduction of greenhouse gas emissions from biomass production, as well as assessing economic impact to the local community and stakeholders involvement along the project's supply chain.

2. Feedstock and Supply Chain Analysis

2.1. Site-Survey Analysis