Optimization of Renewable Energy in Indonesian Energy Mix 2025

Farizal F [a], Fadhel Muhammad [b]

[a,b] Department of Industrial Engineering, Faculty of Engineering, Universitas Indonesia Kampus Baru UI Depok 16424, Indonesia

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ABSTRACT

Access to energy is considered one of basic need for human welfare. Energy is also needed by industry to produce gadgets and provide services. In transportation, energy is needed to move from one point to another point. Due to the increment number of human beings and their changing lifestyle, energy demand is ever increased. Currently, the most commonly used primary energy sources are oil and coal; however, these fossil fuels are non-renewable, unsustainable, and depleted (Sorrell, 2012). Many oil fields have already reached their peak production (Krumdieck, 2010). This decrease poses challenges to oil-dependent economies around the world, including Indonesia. Fossil fuels are also notoriously source of green house gas emission. Indonesia has pledged to reduce its emissions by 29% by 2030 (PLN, 2016). To reach this target, Government Regulation No. 79 of 2014 mandated 23% of the national energy consumed to be supplied by renewable energy (RE) by 2025. Indonesia has a variety of RE resources (RES), including biomass, hydropower, geothermal, municipal solid waste (MSW), ocean, and solar. As Indonesia is an agricultural-based economy, expansive farms provide waste biomass, especially from the production of palm oil and rice. They produce straw, rice husks, leaves, trunks, and other waste materials (Weldekidan, et al., 2020). Located at the intersection of the Ring of Fire and the Alpide belt, Indonesia is estimated to have the greatest geothermal potential in the world. Moreover, as two-thirds of the Indonesian territory are covered by water, hydropower and ocean energy can be used (Farizal and Asri, 2018). However, as most RES require more capital investment than fossil fuel and are not as technologically mature as their fossil fuel counterparts, selecting which RES to develop is important. In energy planning, especially when planning RES to substitute fossil fuel, an energy source is selected not only due to its potential availability (abundant resource) but also its dependability, reliability, cost as well as its accessibility.

Keywords: Renewable energy, energy mix, optimization, mixed integer non linear programming.