ABSTRAK

MUH. ABIGAIL RAMADHAN A. Perancangan Pemasangan Pembangkit Listrik Tenaga Surya Jenis *Bifacial* Dengan Sistem *Off-Grid* Di Danau Universitas Hasanuddin. Dibimbing oleh Dr. Ir. Herry Nugraha, MTBK.

Kebutuhan energi listrik yang terus meningkat serta ketergantungan pada energi fosil menuntut pemanfaatan energi terbarukan secara optimal di area perairan. Penelitian ini bertujuan merancang Pembangkit Listrik Tenaga Surya jenis *bifacial* terapung (*floating photovoltaic*) dengan sistem mandiri (*off-grid*) di Danau Universitas Hasanuddin untuk memenuhi kebutuhan listrik harian Gedung Ipteks sebesar 162,96 kilowatt-hour per hari. Metode penelitian meliputi analisis potensi radiasi matahari lokasi, pemetaan karakteristik perairan, perhitungan beban listrik, perancangan komponen, serta simulasi kinerja dan biaya investasi awal. Hasil penelitian menunjukkan potensi radiasi matahari lokasi rata-rata 5,26 kilowatt-hour per meter persegi per hari yang memberikan efek pendinginan alami dan pantulan cahaya air untuk meningkatkan daya modul. Sistem yang dirancang berkapasitas 40,2 kilowatt-peak menggunakan 60 modul fotovoltaik *bifacial* 670 Watt-peak, 6 unit pengendali pengisian daya surya, 1 unit pengubah arus 50 kilowatt, dan 30 unit baterai berkapasitas 432 kilowatt-hour. Simulasi PVsyst menghasilkan rasio kinerja (*Performance Ratio*) sebesar 73,7 persen. Total biaya investasi awal sebesar Rp1.514.957.500, mencakup komponen kelistrikan Rp1.213.450.000 dan struktur terapung Rp301.507.500. Rancangan ini terbukti layak secara teknis untuk mendukung kemandirian energi bersih kampus.

Kata kunci: PLTS *bifacial*, *floating photovoltaic*, *off-grid*, *performance ratio*, investasi.

ABSTRACT

MUH. ABIGAIL RAMADHAN A. *Design and Installation of an Off-Grid Bifacial Solar Power Plant at the Hasanuddin University Lake*. *Supervised by* Dr. Ir. Herry Nugraha, MTBK.

Increasing electrical energy demand and reliance on fossil fuels necessitate optimal utilization of renewable energy in water bodies. This study aims to design an off-grid floating bifacial solar power plant at Hasanuddin University Lake to supply the daily electrical demand of the Ipteks Building of 162.96 kilowatt-hours per day. The methodology involves analyzing solar radiation potential, mapping water body characteristics, calculating electrical loads, designing system components, and simulating performance as well as investment costs. Results show an average solar radiation potential of 5.26 kilowatt-hours per square meter per day, providing natural cooling and water reflection to enhance module yield. The designed system has a capacity of 40.2 kilowatt-peak using 60 bifacial photovoltaic modules rated at 670 Watt-peak, 6 solar charge controllers, 1 unit 50 kilowatt inverter, and 30 battery units with a capacity of 432 kilowatt-hours. The PVsyst simulation yields a Performance Ratio of 73.7 percent. Total initial investment required is IDR 1,514,957,500, comprising IDR 1,213,450,000 for electrical components and IDR 301,507,500 for the floating structure. This design proves technically feasible to support campus clean energy independence.
Keywords: bifacial photovoltaic, floating photovoltaic, off-grid, performance ratio, investment cost.