

**DESAIN SISTEM ENERGI TERBARUKAN MENGGUNAKAN
SOFTWARE HOMER PRO DENGAN METODE ANALISIS TEKNO-
EKONOMI UNTUK PENERANGAN DI GEDUNG RUMAH SAKIT**

SKRIPSI

Diajukan untuk memenuhi syarat untuk memperoleh gelar Sarjana Teknik Elektro
Program Studi Teknik Elektro



Disusun oleh :
Rafli Athariq
E.5051.1901438

**PROGRAM STUDI S1 TEKNIK ELEKTRO
FAKULTAS PENDIDIKAN TEKNOLOGI DAN KEJURUAN
UNIVERSITAS PENDIDIKAN INDONESIA
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Oleh
Rafli Athariq

Sebuah skripsi yang diajukan untuk memenuhi salah satu syarat memperoleh gelar
Sarjana Teknik pada Fakultas Pendidikan Teknologi dan Kejuruan

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LEMBAR PENGESAHAN SKRIPSI

RAFLI ATHARIQ

E.5051.1901438

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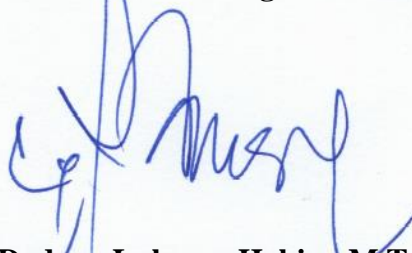
Dosen Pembimbing I



Prof. Dr. Ade Gafar Abdullah, M.Si.

NIP. 19721113 199903 1 001

Dosen Pembimbing II



Dr. Ir. Dadang Lukman Hakim, M.T.

NIP. 19610604 198603 1 001

Mengetahui,

Ketua Program Studi Teknik Elektro



Iwan Kustiawan, S.Pd., M.T., Ph.D.

NIP. 19770908 200312 1 002

ABSTRAK

Di masa ini, penggunaan energi konvensional sudah menjadi kebutuhan primer terutama untuk pembangkit listrik di Indonesia yang masih mengandalkan batu bara, minyak, dan gas. Akan tetapi, penggunaan energi konvensional secara terus-menerus dapat mengakibatkan kerusakan pada iklim dunia dan suatu saat energi tersebut akan habis. Untuk mengatasi permasalahan tersebut, penggunaan energi terbarukan dapat menjadi alternatif untuk dikembangkan mengingat energi tersebut merupakan energi yang ramah lingkungan dan tersedia secara terus-menerus dari alam. Untuk memutuskan sumber daya energi terbarukan yang cocok untuk suatu wilayah, dapat menggunakan analisis tekno-ekonomi sebagai metode yang bisa memperhitungkan perancangan sistem energi terbarukan dari segi teknis dan ekonomis untuk penerangan di gedung rumah sakit. Dalam penelitian ini terdapat satu alternatif energi terbarukan yaitu menggunakan energi matahari. Untuk melakukan perancangan sistem energi terbarukan tersebut digunakan perangkat lunak *Hybrid Optimization of Multiple Energy Resources* (HOMER). Hasil optimasi yang dilakukan oleh HOMER untuk penerangan di gedung rumah sakit dengan bantuan analisis tekno-ekonomi menghasilkan konfigurasi sistem *off-grid/hybrid* yang terdiri atas PV-Grid-Konverter-Baterai dengan *Net Present Cost* (NPC) sebesar Rp. 197,252,600,- dengan harga energi per-kWh atau *cost of energy* (CoE) sebesar Rp. 423,40/kWh dan sistem ini dapat memproduksi energi listrik sebesar 21.981 kWh/tahun. Dengan demikian penggunaan analisis tekno-ekonomi dapat dilakukan untuk pengembangan penelitian terkait sistem energi terbarukan.

Kata kunci : Sistem energi terbarukan, energi matahari, analisis tekno-ekonomi, optimasi sistem energi terbarukan, NPC, CoE

ABSTRACT

In this era, the use of conventional energy has become a primary necessity, especially for power generation in Indonesia, which still relies on coal, oil, and gas. However, the continuous use of conventional energy can lead to climate damage globally, and eventually, these energy sources will deplete. To address this issue, the utilization of renewable energy can serve as an alternative to develop, considering that these sources are environmentally friendly and continuously available from nature. To determine suitable renewable energy resources for a specific region, techno-economic analysis can be employed as a method that considers both technical and economic aspects of designing renewable energy systems, particularly for hospital building lighting. In this research, one renewable energy alternative is solar energy. To design such a renewable energy system, the Hybrid Optimization of Multiple Energy Resources (HOMER) software is used. The optimization results conducted by HOMER for hospital building lighting, aided by techno-economic analysis, yield an off-grid/hybrid system configuration consisting of PV-Grid-Converter-Battery with a Net Present Cost (NPC) of Rp. 197,252,600,- and a cost of energy (CoE) of Rp. 423.40/kWh. This system can generate electrical energy amounting to 21,981 kWh/year. Consequently, the utilization of techno-economic analysis can be applied to the development of research related to renewable energy systems.

Keywords : Renewable energy systems, solar power, techno-economic analysis, optimization of renewable energy, NPC, CoE

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