MODUL HOMER

PROGRAM STUDI TEKNIK ELEKTRO
FAKULTAS TEKNIK
UNIVERSITAS ISKANDAR MUDA
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PRAKATA

Alhamdulillah puji syukur kepada Allah SWT, atas Rachmat dan Karunia-Nya bahwa Modul Homer bagi mahasiswa Teknik Elektro Universitas Iskandar Muda dapat diselesaikan.

Buku Modul Homer ini disusun sebagai acuan bagi mahasiswa dalam pemodelan dari sebuah sistem tenaga listrik dengan menggunakan berbagai pilihan sumber daya terbarukan, sehingga mahasiswa selain dapat menghitung secara manual juga dapat mahir menggunakan komputer dengan menggunakan program Homer.

Menyadari adanya kekurangan dalam penyusunan modul ini, maka saran yang sifatnya membangun dari berbagai pihak sangat diharapkan demi kesempurnaan penyusunan modul ini untuk waktu berikutnya.

Semoga keberadaan modul ini dapat bermanfaat khususnya bagi mahasiswa Teknik Elektro

Penyusun,
Dosen

Safrizal, S.T, M.T

Welcome to HOMER

The HOMER Pro® microgrid software by HOMER Energy is the global standard for optimizing microgrid design in all sectors, from village power and island utilities to grid-connected campuses and military bases. Homer Pro, or HOMER (Hybrid Optimization of Multiple Electric Renewables), simplifies the task of evaluating designs for both off-grid and grid-connected power systems. When you design a power system, you must make many decisions about the configuration of the system, such as:

- Which components are best for this system?
- How many and what size of each component are most efficient?

The large number of technology options, variation in costs, and availability of energy resources make these decisions difficult. HOMER's optimization and sensitivity analysis algorithms make it easier to evaluate the many possible system configurations.

Using HOMER

To use HOMER, you select and enter information under the Design button to provide the model with inputs, including components (e.g., generator, wind, and solar), component costs, and resource availability. You can also add new components, resources, and loads under the Library button.

When you click the Calculate button, HOMER uses these inputs to simulate different system configurations, or combinations of components, and generates results that you can view as a list of feasible configurations sorted by net present cost under the Results button. HOMER also displays simulation results in a wide variety of tables and graphs that help you compare configurations and evaluate them on their economic and technical merits. You can export the tables and graphs for use in reports and presentations.

You can further use the model to perform sensitivity analyses to explore the effects that changes in factors, such as resource availability and economic conditions, might have on the cost-effectiveness of different system configurations. To perform a sensitivity analysis, you provide HOMER with sensitivity values that describe a range of resource availability and component costs. HOMER simulates each system configuration using the range of values. You can use the results of a sensitivity analysis to identify the factors that have the greatest impact on the design and operation of a power system. You can also use HOMER sensitivity analysis results to answer general questions about technology options to inform planning and policy decisions.

How HOMER Works

HOMER simulates energy systems, shows system configurations optimized by cost, and provides sensitivity analyses.

Simulation

HOMER simulates the operation of a system by making energy balance calculations in each time step (interval) of the year. For each time step, HOMER compares the electric and thermal demand in that time step to the energy that the system can supply in that time step, and calculates the flow of energy to and from each component of the system. For systems that

include batteries or fuel-powered generators, HOMER also decides in each time step how to operate the generators and whether to charge or discharge the batteries.

HOMER performs these energy balance calculations for each system configuration that you want to consider. It then determines whether a configuration is feasible, (i.e., whether it can meet the electric demand under the conditions that you specify), and estimates the cost of installing and operating the system over the lifetime of the project. The system cost calculations account for costs such as capital, replacement, operation and maintenance, fuel, and interest.

Optimization

HOMER Pro has two optimization algorithms. The original grid search algorithm simulates all of the feasible system configurations defined by the Search Space. The new HOMER Optimizer® uses a proprietary derivative-free algorithm to search for the least-costly system. HOMER then displays a list of configurations, sorted by net present cost (sometimes called life-cycle cost), that you can use to compare system design options.

Sensitivity Analysis

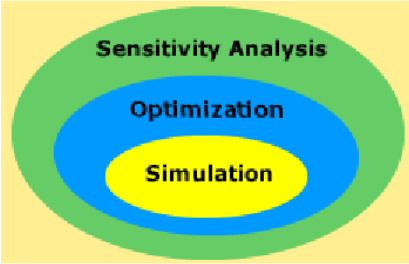
When you define sensitivity variables as inputs, HOMER repeats the optimization process for each sensitivity variable that you specify. For example, if you define wind speed as a sensitivity variable, HOMER simulates system configurations for the range of wind speeds that you specify.

Solving Problems with HOMER

HOMER Pro

HOMER simplifies the task of designing distributed generation (DG) systems—both on- and off-grid. HOMER's optimization and sensitivity analysis algorithms allow you to evaluate the economic and technical feasibility of a large number of technology options and to account for variations in technology costs and energy resource availability.

Working effectively with HOMER requires understanding its three core capabilities; simulation, optimization, and sensitivity analysis; and how they interact.



Simulation, Optimization, and Sensitivity Analysis

Simulation: At its core, HOMER is a simulation model. It attempts to simulate a viable system for all possible combinations of the equipment you want to consider. Depending on how you set up your model, HOMER may simulate hundreds or even thousands of systems.

Optimization: The optimization step follows all simulations. The simulated systems are sorted and filtered according to criteria that you define, so you can see the best possible solutions. Although HOMER fundamentally is an economic optimization model, you may also choose to minimize fuel usage.

Sensitivity Analysis: This is an optional step that allows you to model the impact of variables that are beyond your control, such as wind speed and fuel costs, and see how the optimal system changes with these variations.

HOMER models both conventional and renewable energy technologies.

Power sources in HOMER

- Solar photovoltaic (PV)
- Wind turbine
- Generator: diesel
- Electric utility grid
- Traditional hydro
- Run-of-river hydro power
- Biomass power
- Generator: gasoline, biogas, alternative and

Storage in HOMER

- Flywheels
- Customizable batteries
- Flow batteries
- Hydrogen

Loads in HOMER

- Get started quickly with the HOMER Quick Load Builder and built-in profiles
- Daily profiles with seasonal variation
- Deferrable (water pumping, refrigeration)
- Thermal (space heating, crop drying)
- Efficiency measures

custom fuels, cofired

- Microturbine
- Fuel cell

See also

Simulation Results

Optimization Results

Sensitivity Results