Global Transformation of the Electric Grid

Legacy Bulk Electrical System  \[\rightarrow\]  Microgrids

That Was Then...  \[\rightarrow\]  ...This is Now
Just What is a Microgrid

Modern microgrids include multiple generation/storage resources that continuously provide energy for a specific application.

A microgrid can be connected to a larger grid or operate independently without the need of the main grid.

Reasons for microgrids:

• Improved resiliency
• Economics
• Clean energy mandate
• Grid firming
• Peak demand reduction

A microgrid ranges in size from 2-3 KW to over 100 MW. They comprise of any combination of the following technologies:
Microgrid Applications

**Off-Grid Microgrids**
- Telecom sites
- Remote homes
- Forward operating bases
- Villages and small communities
- Island-Nations
- Mining operations

**On-grid Microgrids**
- Hospitals
- University campuses
- Data centers
- Communities
- Factories and offices
- Hotels
- Critical asset infrastructure
- End-of-the-line grid support
- Homes
Why is this Transformation Happening?

Modern hybridized microgrids are growing today because of one primary reason: economics.

In just the last decade, the cost of solar and wind have declined by as much as 90% and storage over 50%. They are fast becoming mature, bankable technologies.

A standard Power Purchase Agreement for:
- Wind: $.04/kWh (USD)
- Solar: $.06/kWh (USD)
The global microgrid market will rise from $9.8B in 2013 to $35B by 2020

—Transparency Market Research
In only the last five years more than 70,000 microgrids have been considered using HOMER software.

Over 650 microgrids have been considered in Pakistan.
A few Companies Investing in Microgrids

Developers
- REC
- Sanyo
- Shell
- HITACHI
- Hydro Tasmania
- CAT
- SIEMENS

Component Suppliers
- LEONICS
- TESLA
- XANT
- ABB
- EarthSpark
- Panasonic
- MiniSystem

Education
- Duke University
- EnElec
- EnSync
- Trojan
- CanadianSolar
- SolarCentury

Engineering Firms
- CADMUS
- NAVIGANT
- MIT
- TESS
- Solenergy
- Intelligent Energy
- ARUP

Government & Financial Institutions
- IFC
- IDB
- e.on
- Green Power

Utilities
- Enel
- Engie
- New York Power Authority
- Edison
- ConEdison
But What Technologies are Best?

The question is how much of what energy generation and storage technologies make the most economic sense?

• It depends on:
  o Available resources
  o Size and variability of loads
  o Equipment prices
  o Equipment performance/maintenance
  o Grid or no grid
  o On the ground conditions

How you get there is through Economic Optimization Modeling
HOMER = Hybrid Optimization of Multiple Energy Resources

- Technology agnostic software platform. Model virtually any type & combination of distributed energy generation and storage technologies.
- Simulates real-world performance and delivers a choice of optimized designs.

HOMER Energy is the leading software company for Economic Optimization for Microgrids and Demand Charge reduction in DER applications to understand least cost solutions.
HOMER® Pro

• Technology agnostic platform provides accurate, unbiased results

• Simplifies the complex process of determining lowest COE for microgrid and DER systems when considering multiple technologies

• Capable of modeling virtually any combination of energy generation and storage technology. Customize models to meet your specific needs

• Simulates the design with real-life resources, load data, and components operational costs

• Compare thousands of possibilities in a single model run

• Sensitivity analysis that allow for “what-if” scenarios through out the model. What-if fuel prices increase by 20% in five years?
HOMER PRO – How it Works

Project Inputs
- Load Profile
- Site-Specific Resources
- System Components

Analysis
- Sensitivity Analysis
- Optimization
- Simulation

Results
- Economic & Engineering
  - System Sizing
  - Performance Details
  - Financials
  - Various Reports
Consulting Services

Over the last two decades HOMER Energy has provided consulting services for companies and governments around the world as a leader in the areas of microgrids. A sample of our projects include:

- IRENA Report – minigrids technology Outlook
- Asian Development Bank HOMER Pro Training program 2015
- Hôpital Universitaire de Mirebalais 2014-2015
- Inter-American Development Bank (IDB) Sustainable Energy for Haiti 2014
- World Bank Eastern Caribbean Energy Regulatory Authority (ECERA), 2014
- Fort Bragg Analysis of Generation Alternatives, 2012
- Necker Island Conceptual Design and RFP Support, 2012
- Carbon War Room Island Initiative in Aruba, 2011
- Professional Capacity Development Using the HOMER Software for Hybrid Renewable Power Systems in Colombia, 2014
- Resource Mix and Generation Options for forming a Boulder Municipality, 2012 – 2013
- Hybrid Power Feasibility Analysis for 3 Remote Canadian Communities, 2012 – 2013
- Electric grid modeling of the Commonwealth of the Northern Marinas Islands (CNMI), 2012
- Secretariat of the Pacific Community Island Power Utilities Manager Training for the Federated States of Micronesia, 2012
- Renewable Energies for Remote Areas and Islands (REMOTE), 2012
- PLN Indonesia Training and Capacity Building in off-grid renewables and rural electrification, 2012
- USAID Powering Health, 2010 – Present
- Technical Support for Alaskan Wind-Diesel Systems, 2006
- Bermuda Electric Light Company - Integration of Distributed Renewable Power Projects into an Island Utility, 2007-2009
HOMER Energy Training

- Instructor-led training, available in-person or online.
- Train front-line sales engineers to use HOMER to qualify incoming leads.
- Train inside engineers to use HOMER to conduct competitive analysis of other products.
- Train engineers to use HOMER to establish the primary microgrid design.
Try HOMER for Free

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HOMER’s demand charge reduction tool with utility rate database
(United States, Canada and Mexico)

https://www.homerenergy.com/homer-pro.html
HOMER’s “Flagship product” – Can model virtually any distributed
energy generation or storage technology on or off the grid.