

*Optimizing Clean Power Everywhere*

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# Backing up Unreliable Grids with a Microgrid

Asia Clean Energy Forum  
Deep Dive Workshop  
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# Inputs

Simple Rates
  Real Time Rates
  Scheduled Rates
  Grid Extension

Parameters | **Reliability** | Emissions

## Grid Reliability

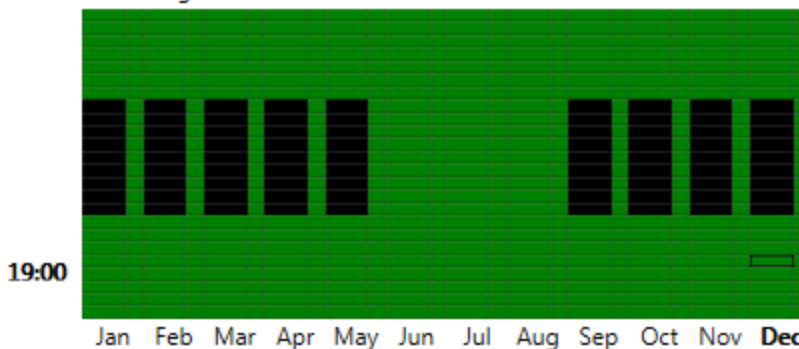
### Random failures

Mean failure frequency (1/yr)  **3**

Repair time mean (h)  **4**

Repair time variability (%)  **2**

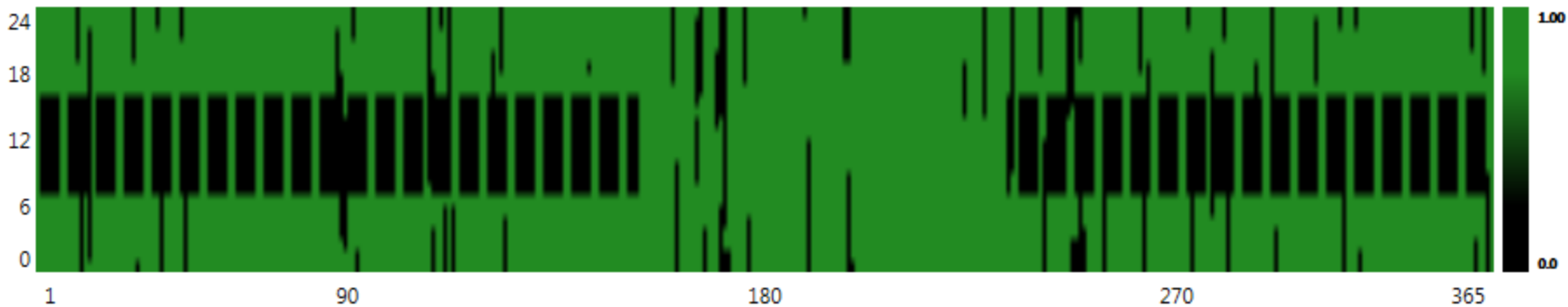
### Scheduled Outages



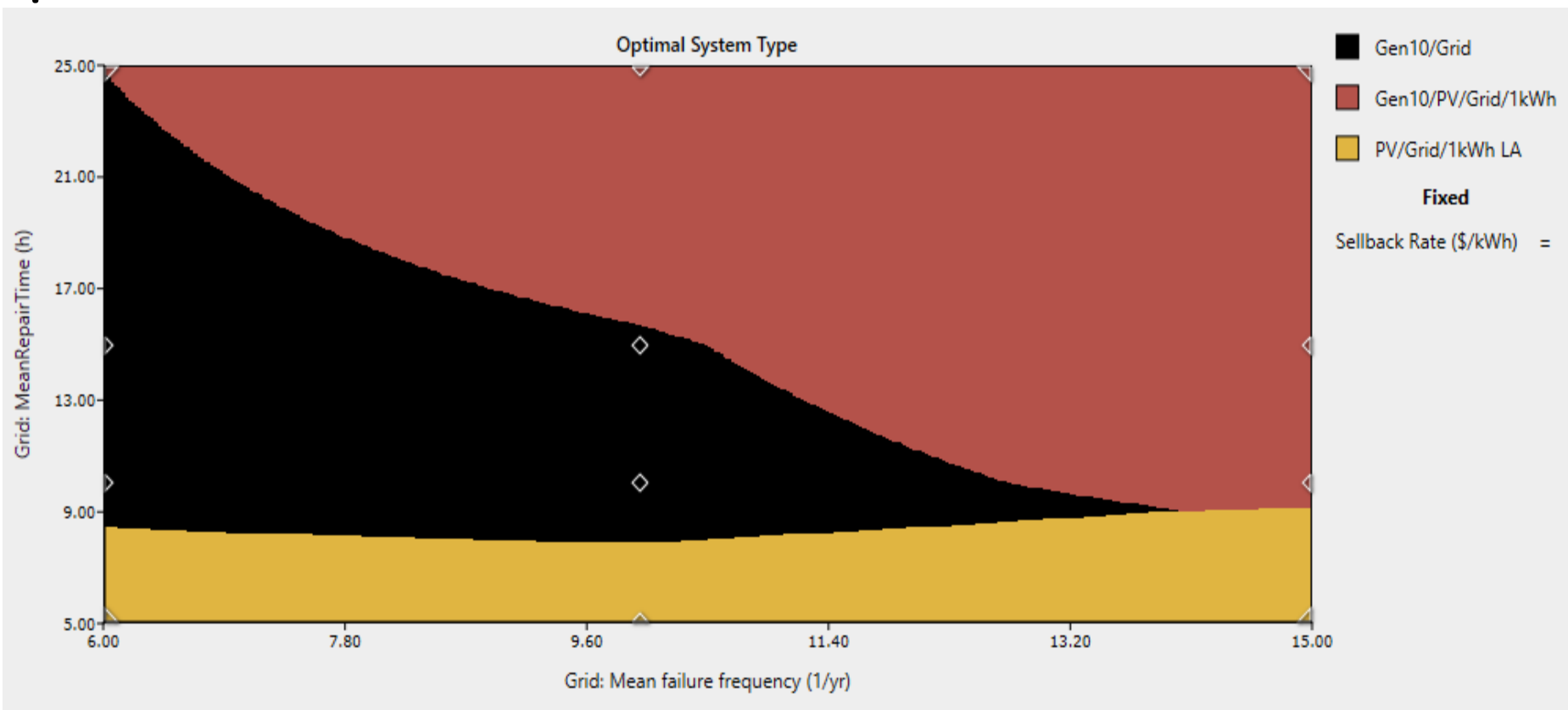
Normal/outage  
 Normal Operation  
 Outage

Weekday/weekend  
 All Week  
 Weekdays  
 Weekends

### Grid outages



# Random Outages



- Simple Diesels best if outages are infrequent.
- Simple PV-Battery best if outages are short
- Hybrids are best in most cases

# What's New with HOMER Pro

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## New components

- Thermal load controller
- Concentrating PV
- MPPT/Dedicated PV Inverter
- Hydrokinetic

## Improved Components

- **Grid-connected battery**
- **Grid outages**
  - **Scheduled and random**
- Up to 20 generators
- Up to 10 PV arrays
- Wind turbine losses
- Maintenance schedules
- Minimum generator runtimes
- Fuel minimization

## Library

- Store cost data in the library
- All components, loads, settings and resource in library
- Library management tool

## New Results

- Choose parameters for summary tables
- Sort and filter on any output
- Direct results export to .CSV (spreadsheet format)

## New Input capabilities

- **Built-in default load profiles**
- Obtain resource data by clicking on a map or typing address

## APIs

- Application Programming Interfaces
- Custom dispatch modules

## Parallel processing

# Wind turbine losses

Power Curve	Turbine Losses	Maintenance
Availability Losses (%):		3.00
Wake Effects Losses (%):		0
Turbine Performance Losses (%):		1.00
Electrical Losses (%):		1.00
Environmental Losses (%):		1.00
Curtailement Losses (%):		5.00
Other Losses (%):		1.00
Overall Loss Factor (%):		11.48

# Maintenance Schedules

Fuel Resource | Fuel Curve | Biogas | Emissions | Maintenance | Schedule

Consider Maintenance Schedule

Procedure	Interval (op hrs.)	Down time (real hrs.)	Cost (\$)
Oil & filter change	300	10	300
Minor overhaul	10000	96	5000
Major overhaul	30000	240	10000

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- Also available for wind turbines