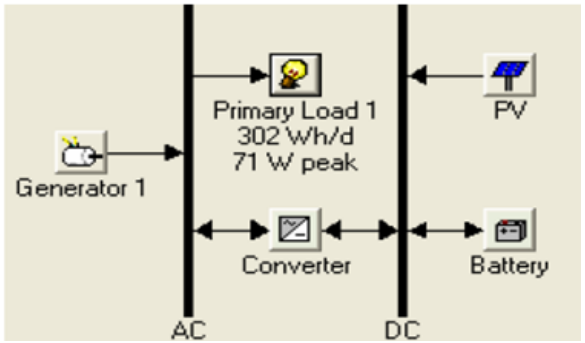
EECE326 Fundamentals of Energy
Lab 9: HOMER



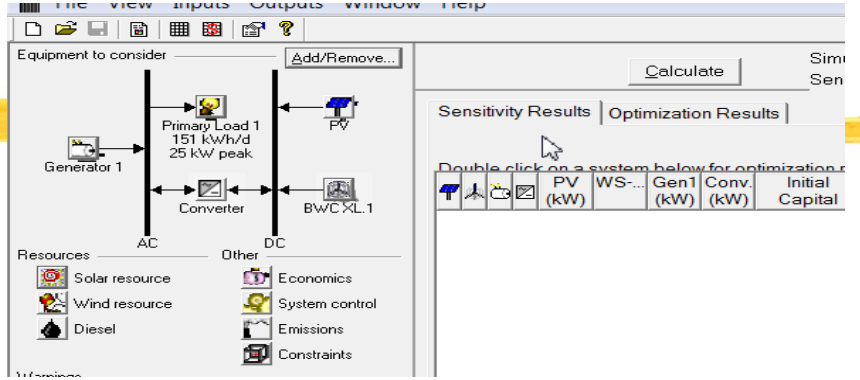
Charles Kim

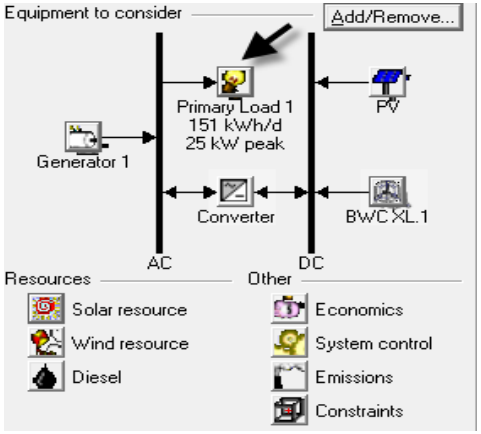
Howard University

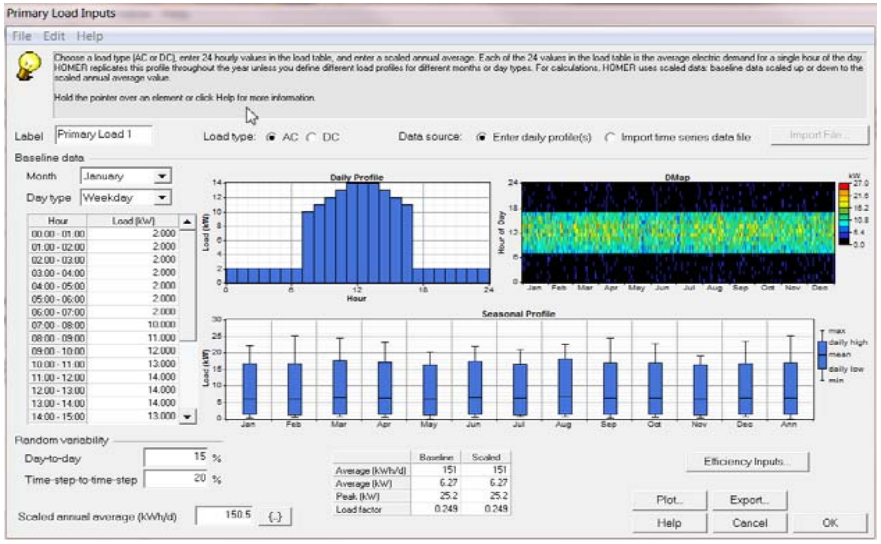
www.mwftr.com

Lab 9 - HOMER

- 1. “ExampleProject.hmr”
- 2. Open the Example Project File: ExampleProject.hmr
- 3. Click the Primary Load





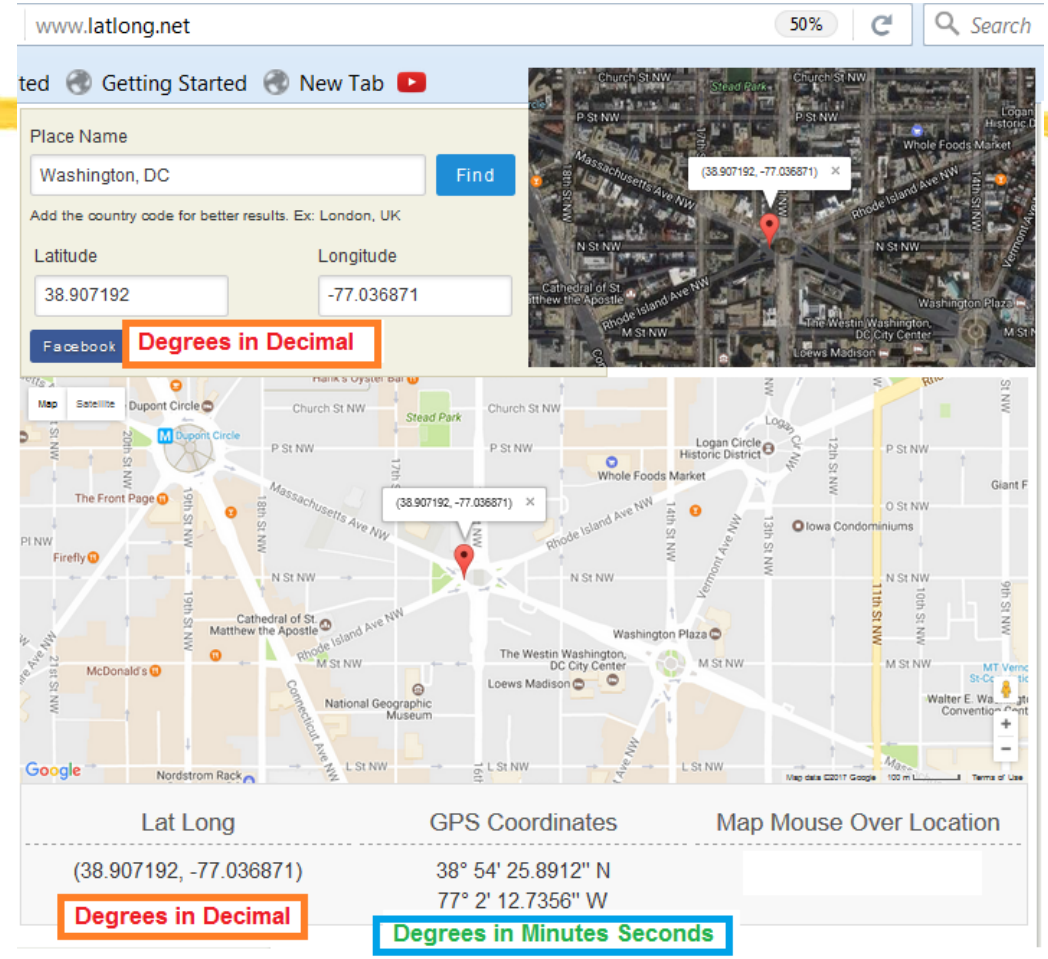


- 4. Exit out of HOMER – We have things to do

Find the Site [Location]

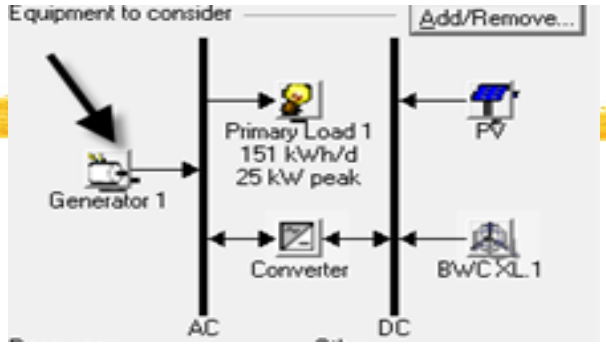
- **Latitude and Longitude**

- Your dorm room
- Your home
- Your favorite place

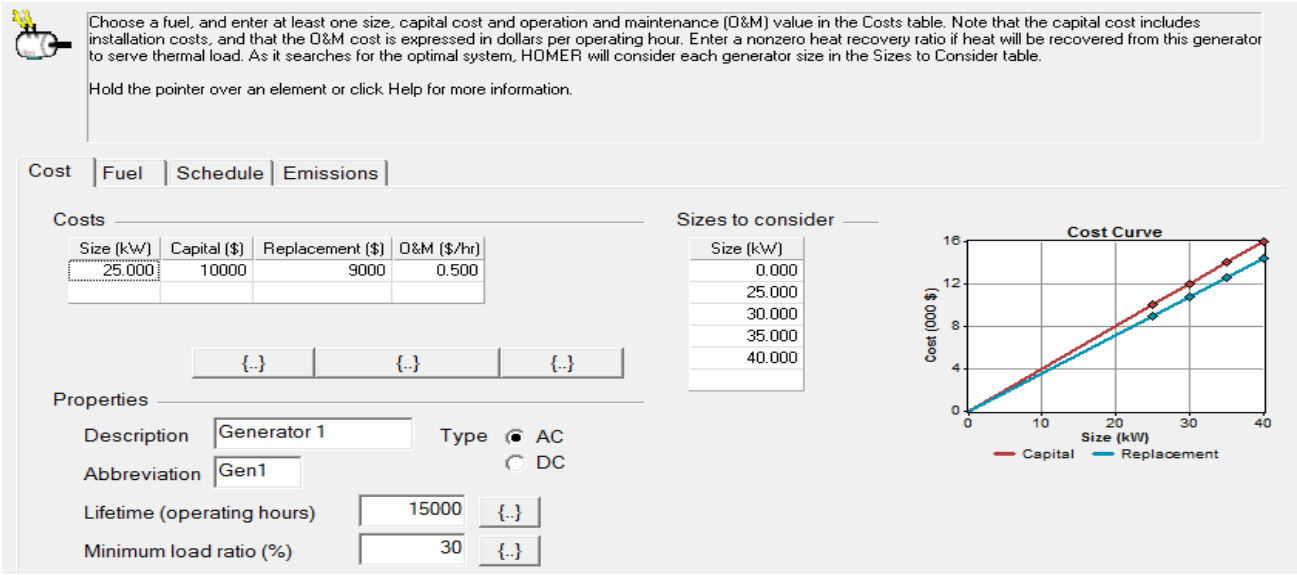


HOMER: Open the file again

- Click the generator

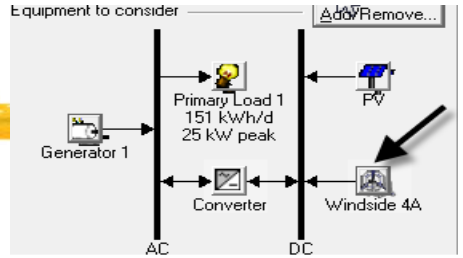


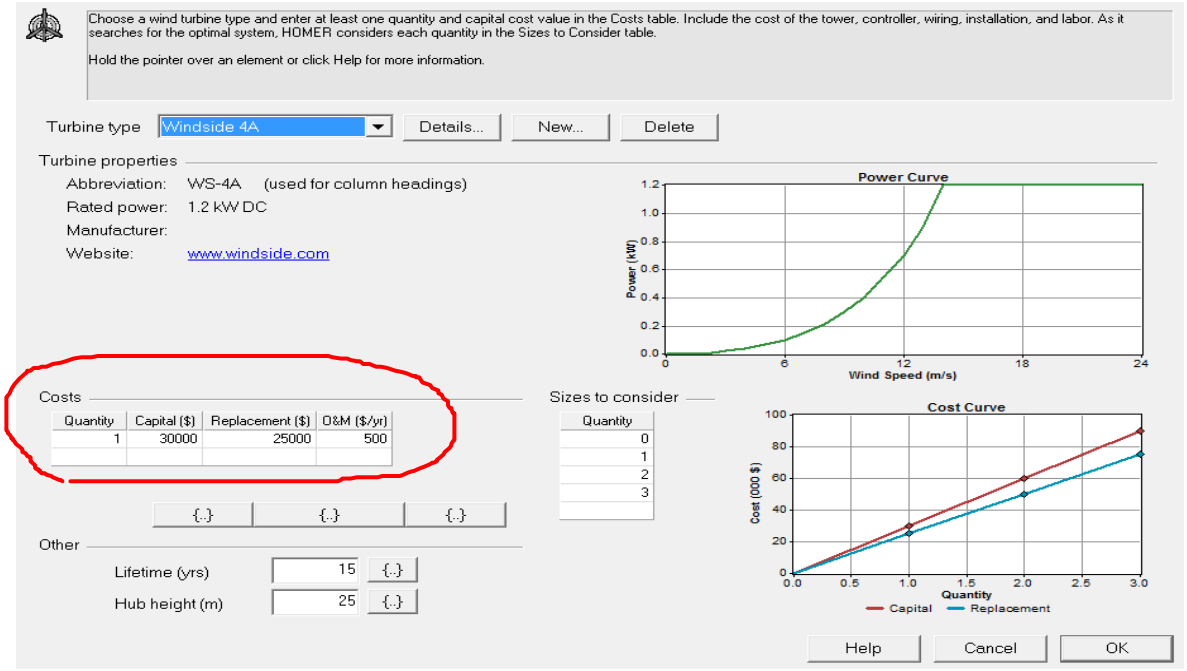
- 25 kW $10,000
- Minimum running at 30%



Equipment

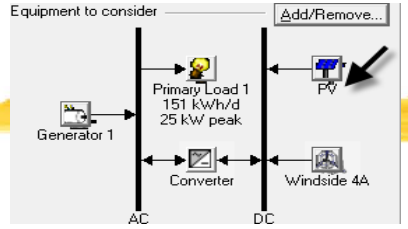
- Click Wind Turbine
  - From the drop down list click through the wind turbines and look at the power curve. Try to find a Wind Turbine that would best maximize Average Wind Speed (m/s) :3.27



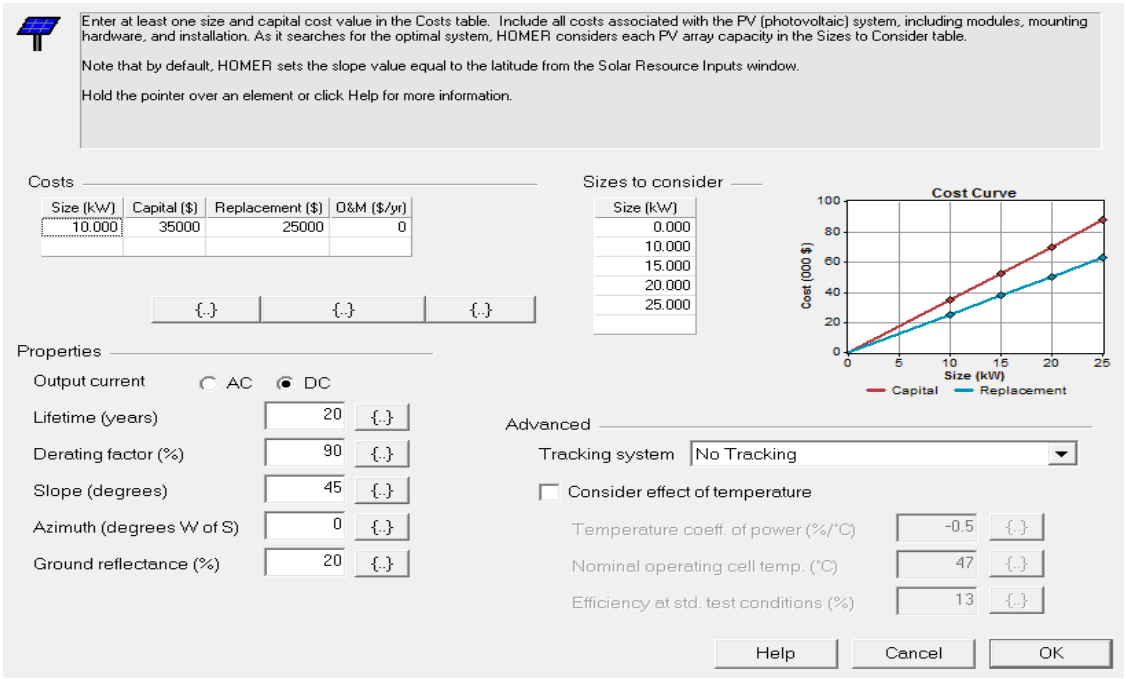


Equipment

- Click PV



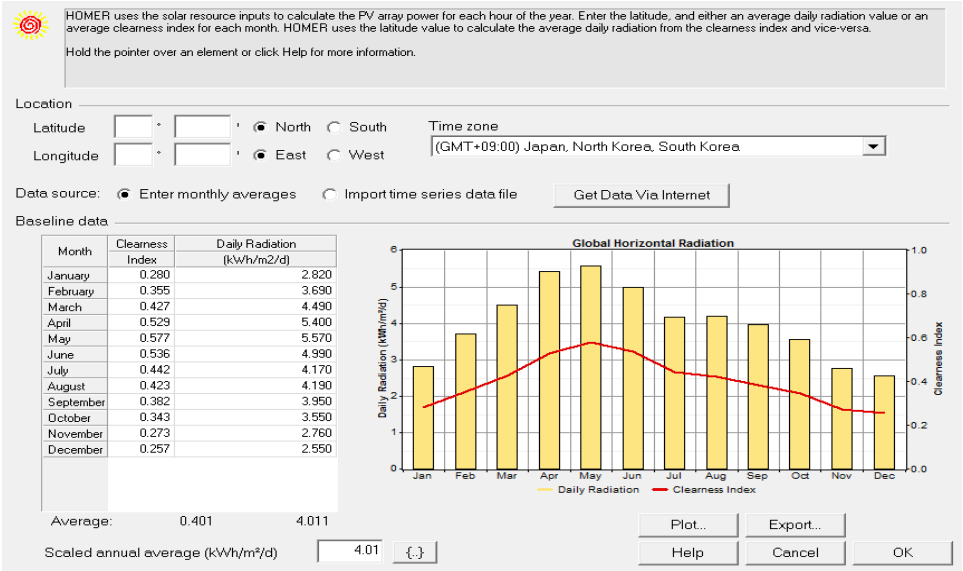
- Lifetime, De-rating factor, slope, No-tracking

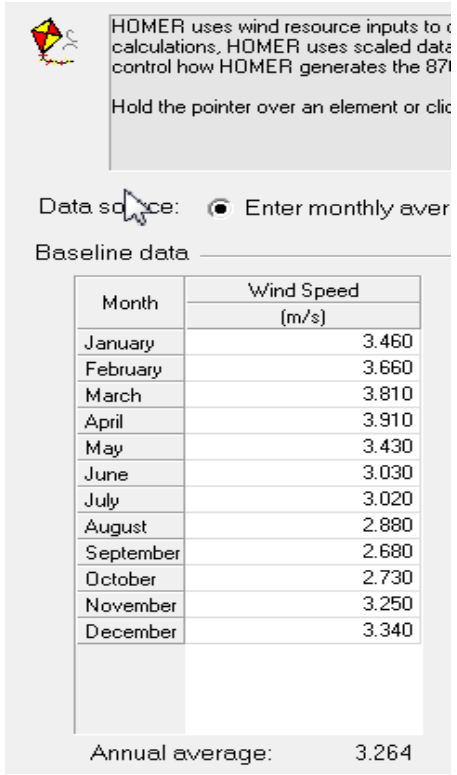


Solar Resources: Enter your Lat/Long and click "Get Data via Internet"
Wind Resources: Try https://www.weather-and-climate.com for monthly wind speed data for selected cities

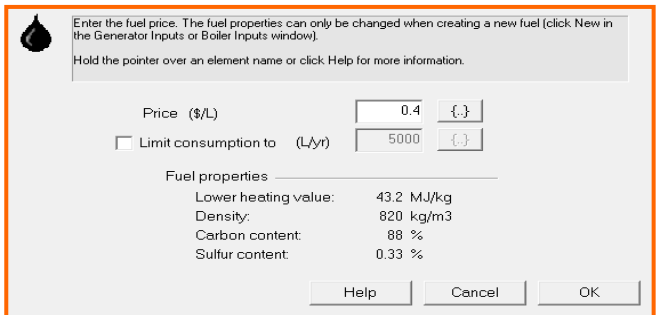
Resource Information

- Select Solar Resources, Wind Resources, and Diesel
- Type in Solar Radiation
- Type in Wind Speed



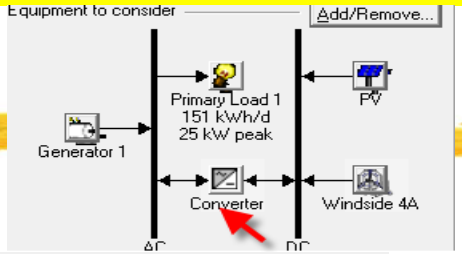


- Diesel Fuel Price



Equipment

- Click Converter icon
- 5kW $4,000



A converter is required for systems in which DC components serve an AC load or vice-versa. A converter can be an inverter (DC to AC), rectifier (AC to DC), or both.

Enter at least one size and capital cost value in the Costs table. Include all costs associated with the converter, such as hardware and labor. As it searches for the optimal system, HOMER considers each converter capacity in the Sizes to Consider table. Note that all references to converter size or capacity refer to inverter capacity.

Hold the pointer over an element or click Help for more information.

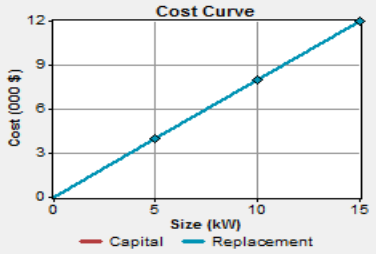
Costs

Size (kW)	Capital ($)	Replacement ($)	O&M ($/yr)
5.000	4000	4000	0

{..} {..} {..}

Sizes to consider

Size (kW)
0.000
5.000
10.000
15.000



Inverter inputs

Lifetime (years) 15 {..}

Efficiency (%) 90 {..}

☑ Inverter can operate simultaneously with an AC generator

Rectifier inputs

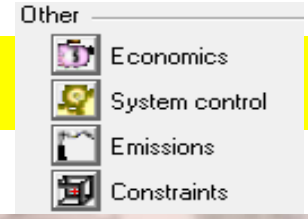
Capacity relative to inverter (%) 100 {..}

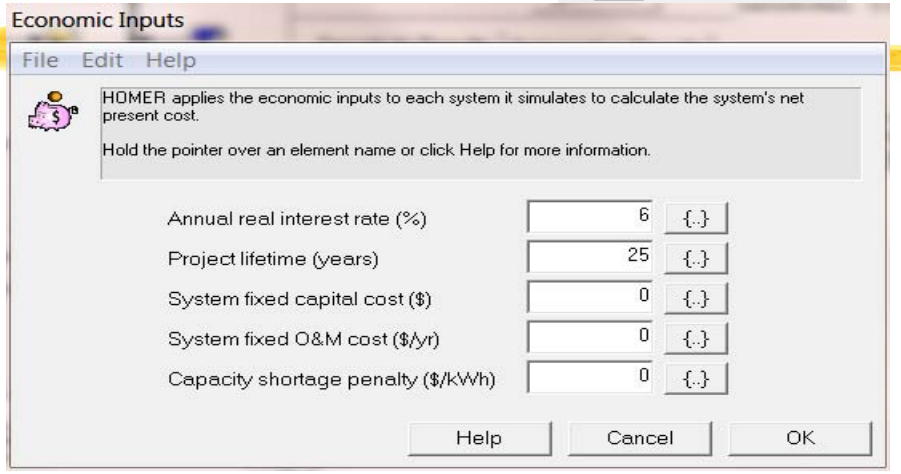
Efficiency (%) 85 {..}

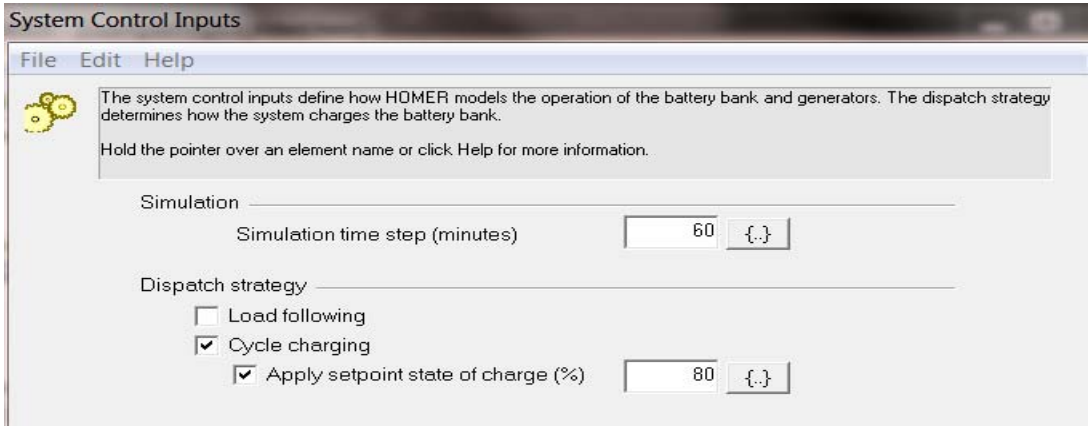
Help Cancel OK

Other Information

- Economics
  - Real interest 6 %
  - Lifetime 25 years
- System Control
  - Cycle-charging

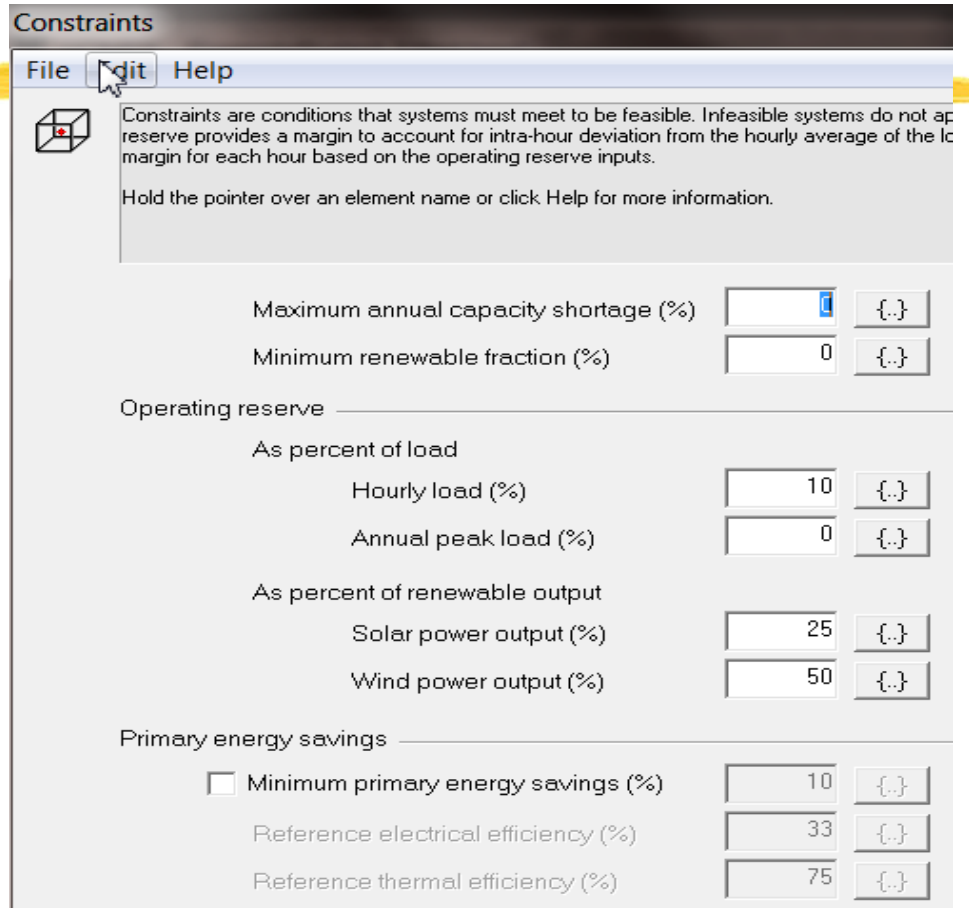




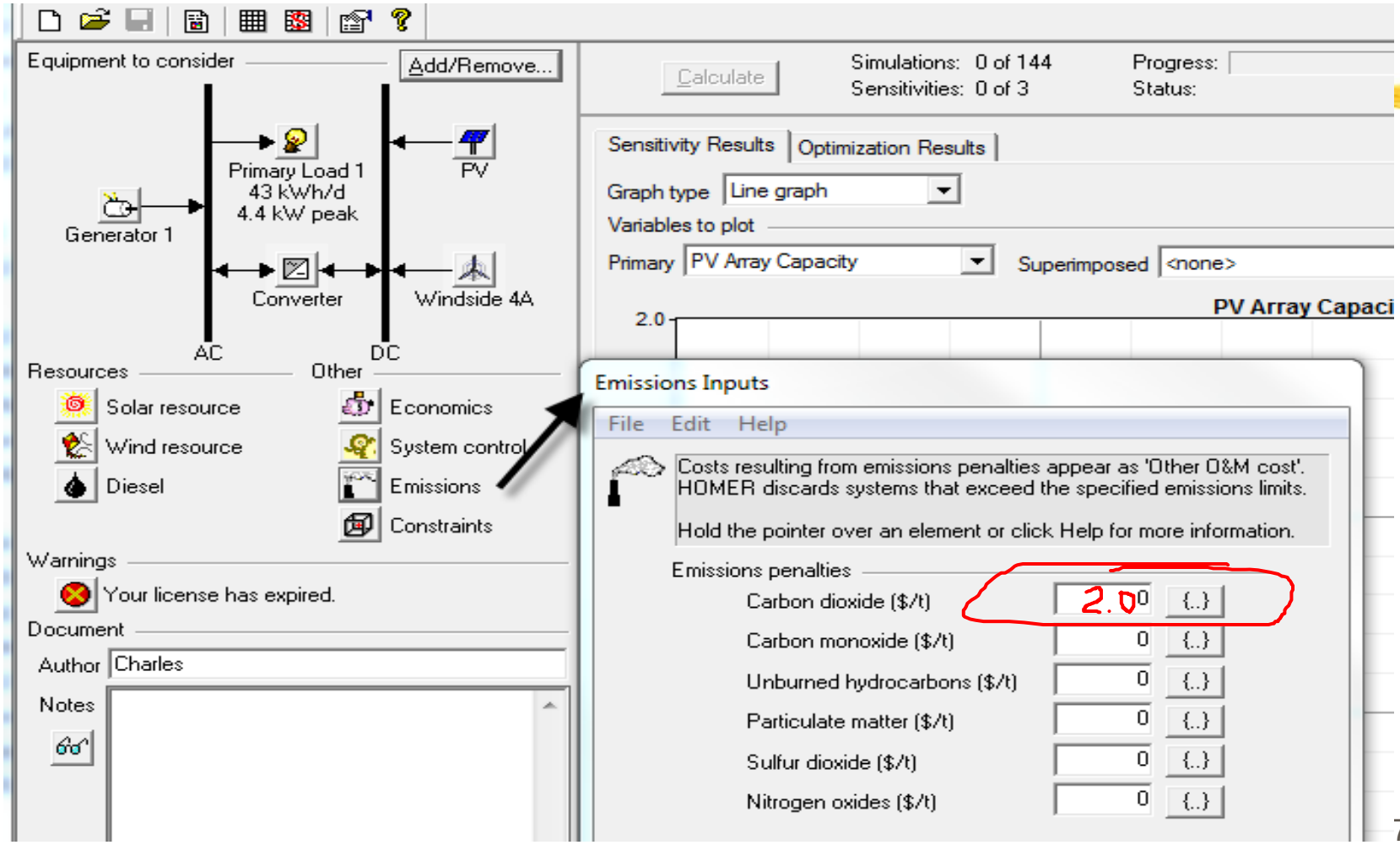


Other Information

- Constraints
  - Operating reserve 10%
  - Capacity shortage 0%

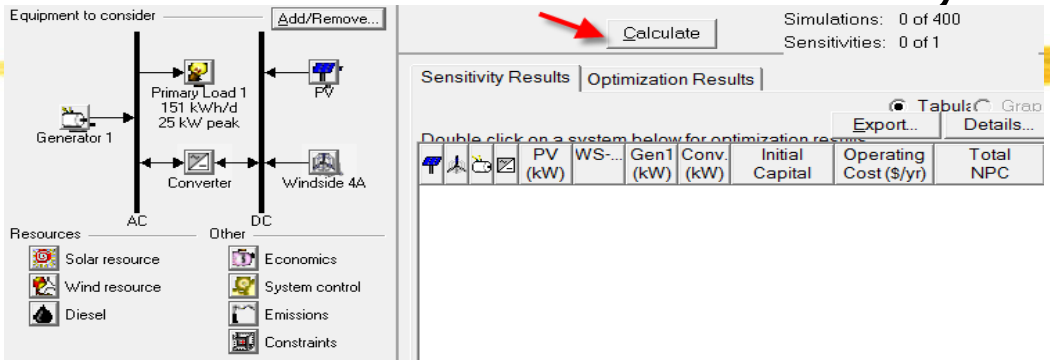


Emission Input – Emission Penalty

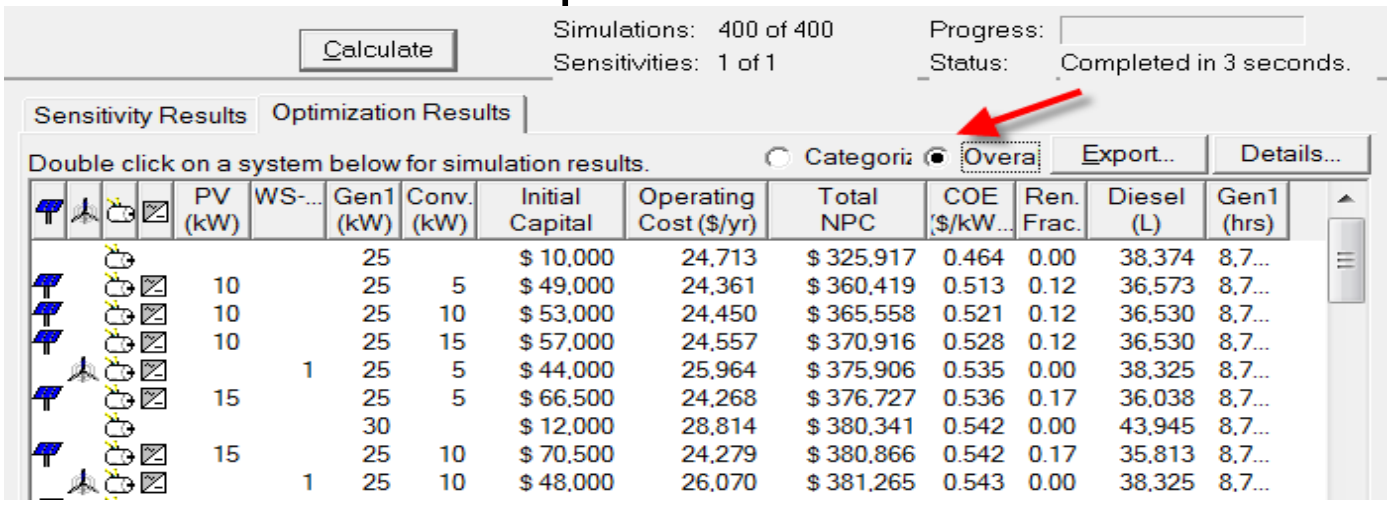


Analysis of the System

- 1. Click “Calculate” to start the analysis

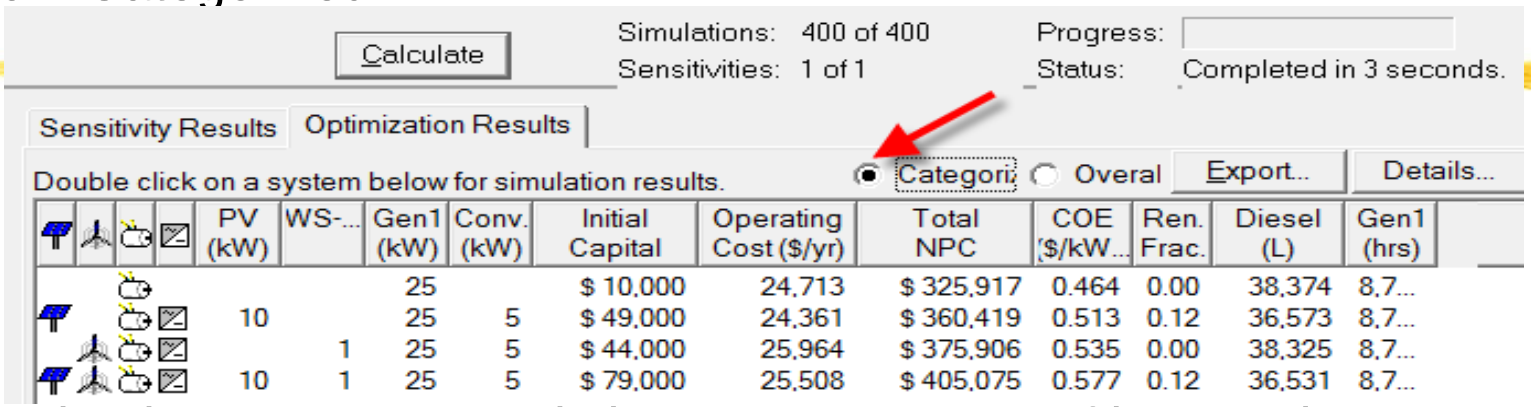


- Click Overall: view all possible combinations



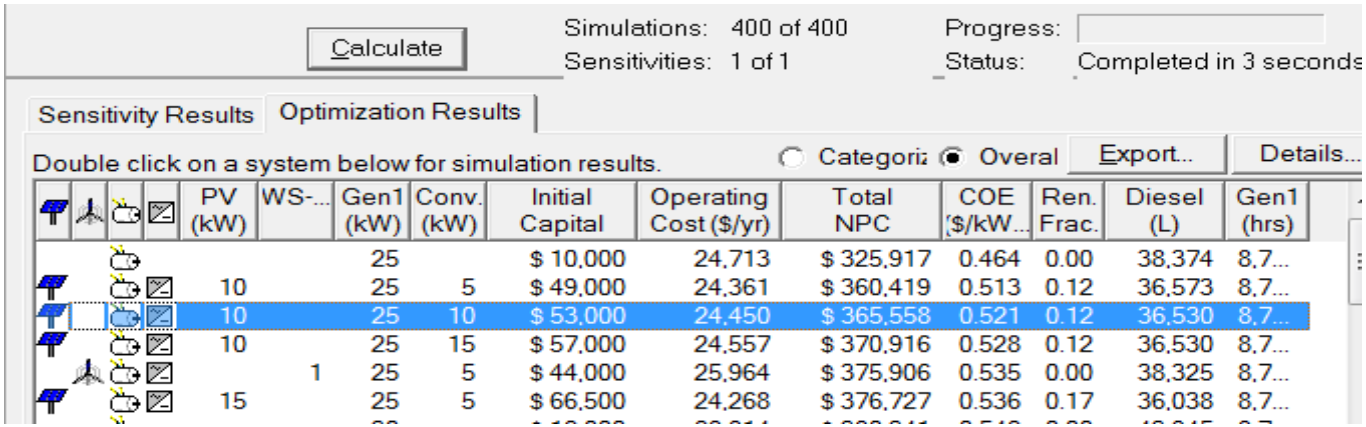
Analysis of the System

- Click “Categorized”



PV (kW)	WS-...	Gen1 (kW)	Conv. (kW)	Initial Capital	Operating Cost ($/yr)	Total NPC	COE ($/kW...	Ren. Frac.	Diesel (L)	Gen1 (hrs)
		25		$ 10,000	24,713	$ 325,917	0.464	0.00	38,374	8,7...
10		25	5	$ 49,000	24,361	$ 360,419	0.513	0.12	36,573	8,7...
	1	25	5	$ 44,000	25,964	$ 375,906	0.535	0.00	38,325	8,7...
10	1	25	5	$ 79,000	25,508	$ 405,075	0.577	0.12	36,531	8,7...

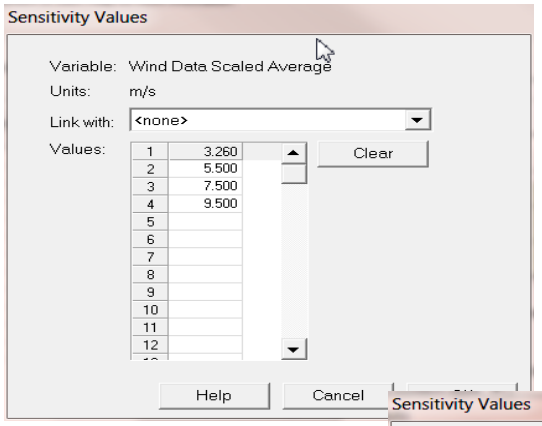
- Now back to “Overall”, and choose any system of interest by clicking/ double clicking



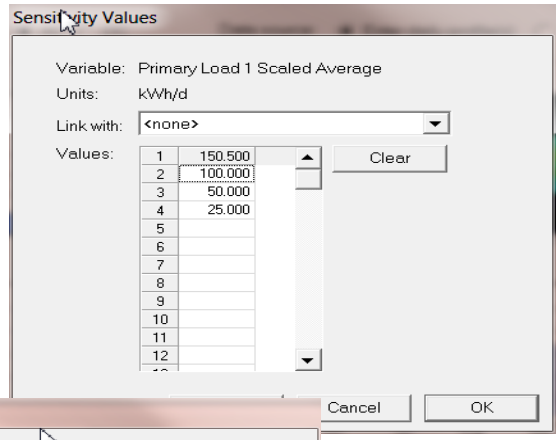
PV (kW)	WS-...	Gen1 (kW)	Conv. (kW)	Initial Capital	Operating Cost ($/yr)	Total NPC	COE ($/kW...	Ren. Frac.	Diesel (L)	Gen1 (hrs)
		25		$ 10,000	24,713	$ 325,917	0.464	0.00	38,374	8,7...
10		25	5	$ 49,000	24,361	$ 360,419	0.513	0.12	36,573	8,7...
10		25	10	$ 53,000	24,450	$ 365,558	0.521	0.12	36,530	8,7...
10		25	15	$ 57,000	24,557	$ 370,916	0.528	0.12	36,530	8,7...
	1	25	5	$ 44,000	25,964	$ 375,906	0.535	0.00	38,325	8,7...
15		25	5	$ 66,500	24,268	$ 376,727	0.536	0.17	36,038	8,7...

Sensitivity Analysis

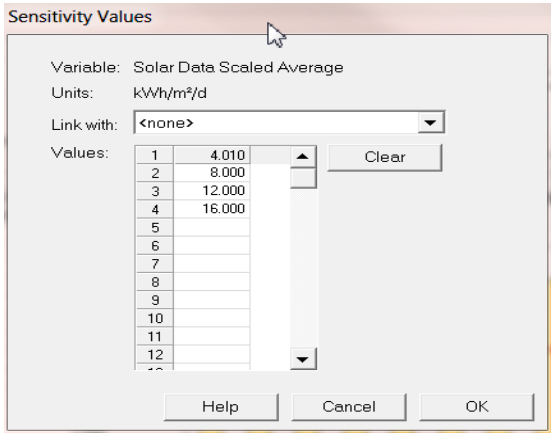
- Click Wind resource
- Click “Edit Sensitivity Values” >> **Do so for Load, Solar, and Diesel**
- Wind Resources



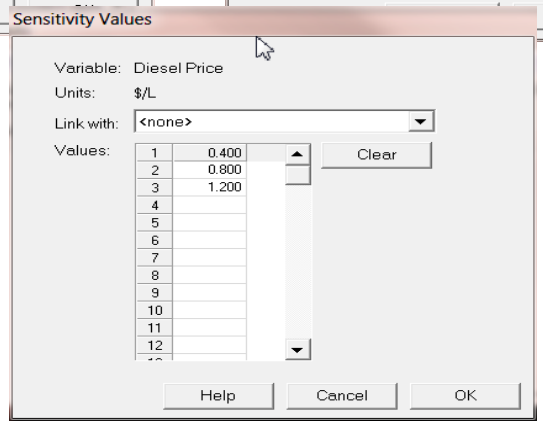
- Primary Load



- Solar Resources

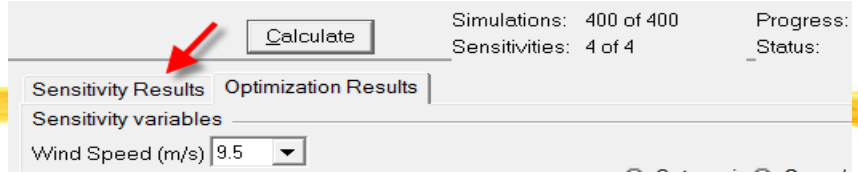


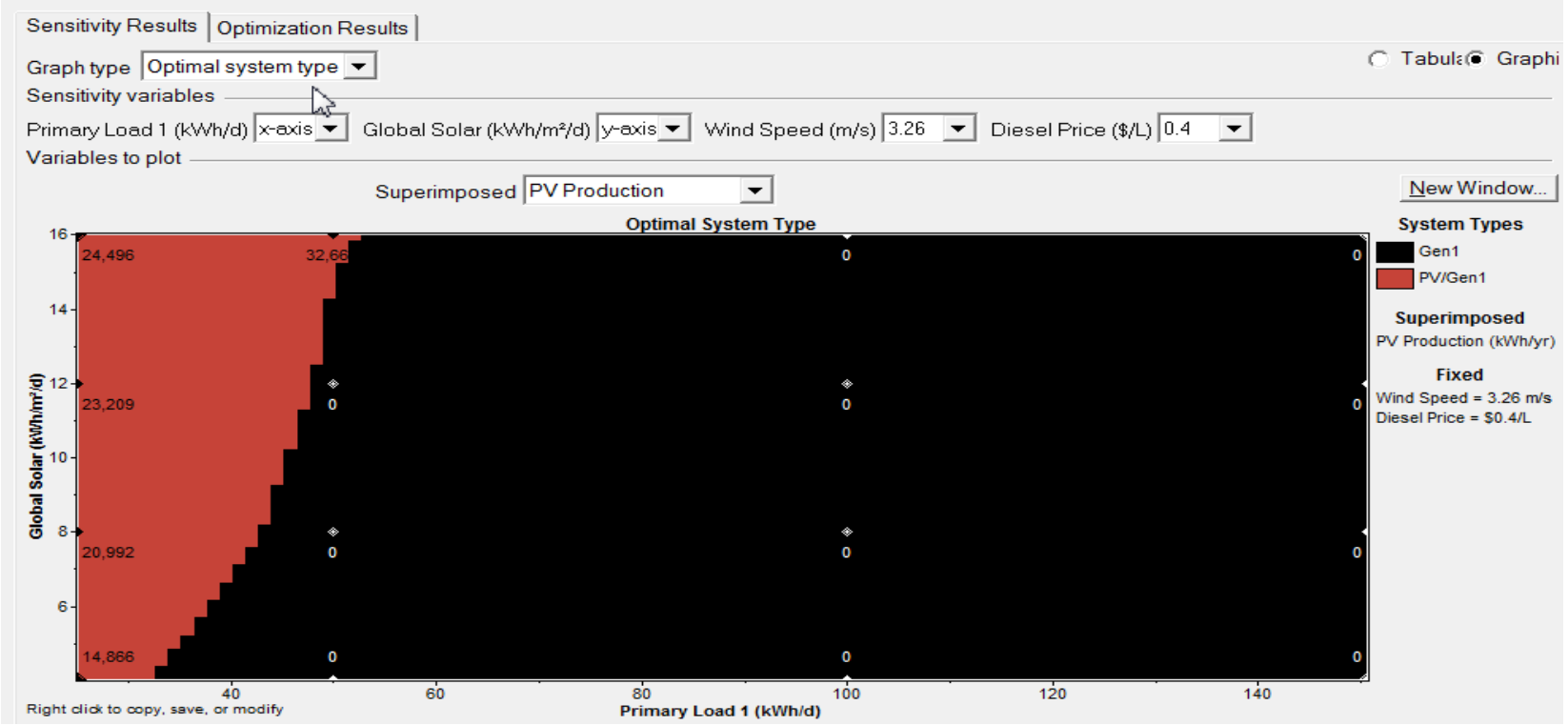
- Diesel Fuel



Sensitivity Analysis

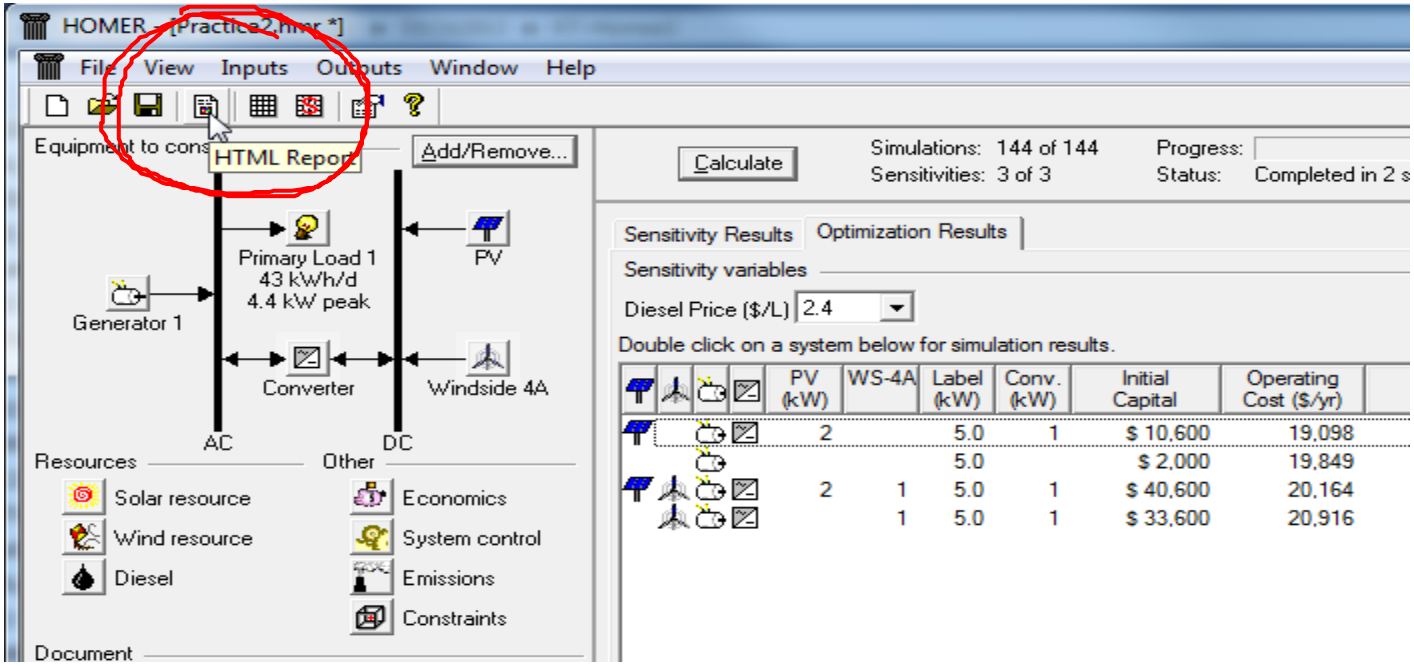
- Save and Calculate
- New we see the tab for "Sensitivity Results"





Input Summary Report generation

- HOMER Produces An Input Summary Report:
  - Click HTML Input Summary from the File menu, or click the toolbar button:
  - HOMER will create an HTML-format report summarizing all the relevant inputs, and display it in a browser. From the browser, you can save or print the report, or copy it to the clipboard so that you can paste it into a word processor or spreadsheet program.



Input summary Report - Example

Practice2.hmr - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Practice2.hmr

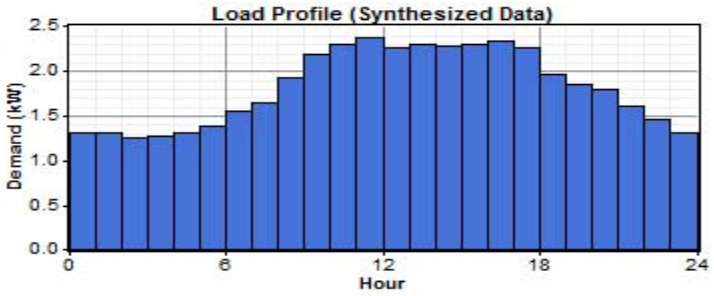
file:///C:/Users/ckim/AppData/Local/Temp/Practice2.htm

HOMER Input Summary

File name: Practice2.hmr
File version: 2.68 beta
Author: Charles

AC Load: Primary Load 1

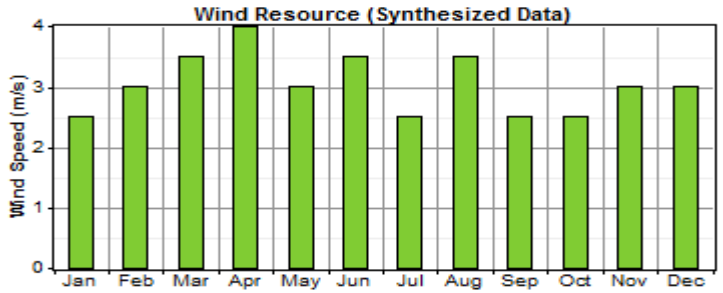
Data source:	Synthetic
Daily noise:	15%
Hourly noise:	20%
Scaled annual average:	43.4 kWh/d
Scaled peak load:	4.36 kW
Load factor:	0.414



PV

Size (kW)	Capital ($)	Replacement ($)	O&M ($/yr)
2.000	7,000	7,000	0

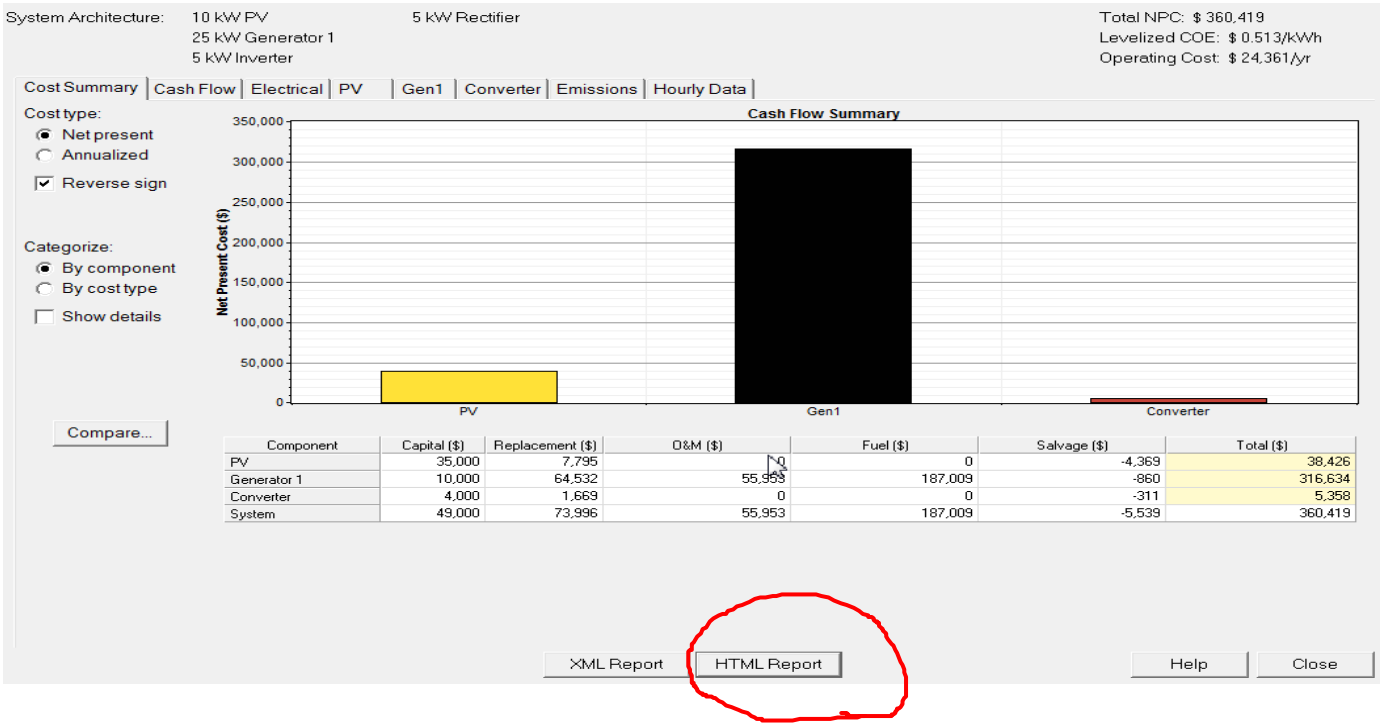
Sizes to consider:	0, 2, 4, 6 kW
Lifetime:	20 yr
Derating factor:	80%
Tracking system:	No Tracking
Slope:	0 deg
Azimuth:	0 deg
Ground reflectance:	20%



Weibull k:	2.00
Autocorrelation factor:	0.850
Diurnal pattern strength:	0.250
Hour of peak wind speed:	15
Scaled annual average:	3.04 m/s
Anemometer height:	10 m
Altitude:	0 m
Wind shear profile:	Logarithmic
Surface roughness length:	0.01 m

System Report generation

- HOMER Produces A Report Summarizing The Simulation Results
  - Just click the HTML Report button in the Simulation Results window:



Example System Report

System Report - Practice2.hmr

Sensitivity case

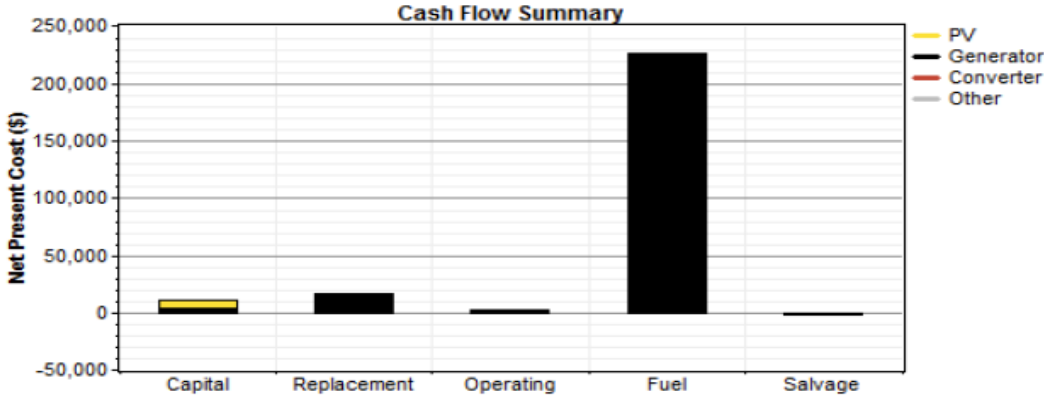
Diesel Price: 2.4 $/L

System architecture

PV Array	2 kW
Generator 1	5 kW
Inverter	1 kW
Rectifier	1 kW

Cost summary

Total net present cost	$ 254,738
Levelized cost of energy	$ 1.258/kWh
Operating cost	$ 19,098/yr



Net Present Costs

Component	Capital	Replacement	O&M	Fuel	Salvage	Total
	($)	($)	($)	($)	($)	($)
PV	7,000	2,183	0	0	-1,223	7,959
Generator 1	2,000	14,340	2,238	225,506	-191	243,893
Converter	1,600	668	0	0	-124	2,143
Other	0	0	742	0	0	742
System	10,600	17,191	2,980	225,506	-1,539	254,738

Electrical

Component	Production	Fraction
	(kWh/yr)	
PV array	2,341	13%
Generator 1	15,396	87%
Total	17,737	100%

Report Submission for Lab 9

- Write your report describing
  - Location
  - Load
  - Solar Resources
  - Wind Resources
  - Optimum result (the Price of energy. $/kWh)?
  - Comment and Opinion
  - Appendix 1: Input Summary Report from HOMER
  - Appendix 2: System Report from HOMER