Leon County Energy Sustainability

Team 306:

Samantha Lafrance
Jacob Moore
Christopher Gibson
Sean Fisher
Marwan Kamleh

Project Recap

Background

In 2019, Leon County set forth ambitions of reducing Greenhouse Gas emissions by 30% by 2030, part of their Integrated Sustainability Action Plan (ISAP).

Three key components of these targets:

- Increase Renewable Generation Capacity 30% by 2030 in County parks and facilities
- Reduce kWh usage 2% annually, resulting in 30% net reduction by 2030
- Increase public awareness of Renewable Energy

Project Scope

J. Lewis Hall Park in Woodville was chosen for us to do our project on. this project entails a number of different parts:

1. Economic Analysis modeling implementation of different renewable systems
2. Load study to model the effects of implementing these different systems
3. Design set for Pilot Project Prototype, to be constructed by county personnel for use in the park

Vendor Data

Gathering Data

- Met with different vendors via zoom
- Gathered data from them
- Received more insight on products

AHP Comparison Matrix

- Matrix based off of requirements for the project
- Explains most important criteria to look for

	Appeal	Price	Durability	Promotes Renewable energy	Battery Storage	Charging Power	Total
Appeal	1.00	0.25	0.25	0.20	0.33	0.33	2.37
Price	4.00	1.00	0.50	0.25	0.33	0.50	6.58
Durability	4.00	2.00	1.00	0.25	3.00	3.00	13.25
Promotes Renewable energy	5.00	4.00	4.00	1.00	4.00	4.00	22.00
Battery Storage	3.00	3.00	0.33	0.25	1.00	3.00	10.58
Charging Power	3.00	2.00	0.33	0.25	0.33	1.00	6.92

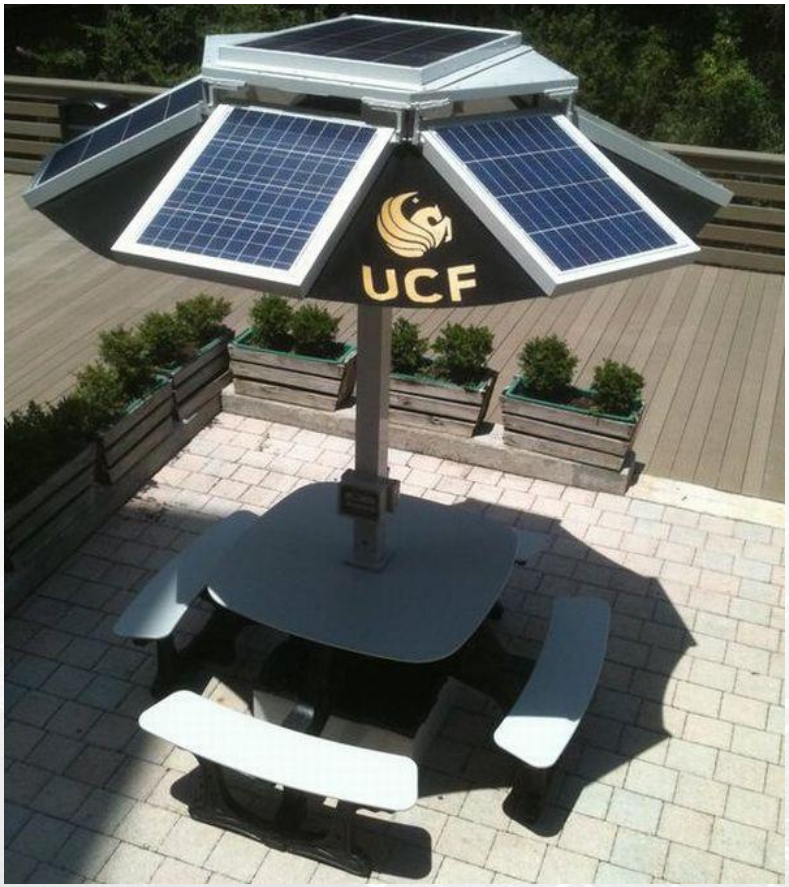
Solar Powered Charging Umbrellas

Sitescapes Solar charging Umbrella

Enerfusion Solar charging Canopy (also Umbrella)

Solar Powered Charging Stations

Enerfusion Solar-powered Charging Dok



GoCharge Charging station

Solar Powered Charging Station cont...

KayPark Solar Powered Charging Station

Comparing Solar powered Charging Stations/Umbrellas

	Enerfusion Solar-Powered Dok	Enerfusion Solar-Powered Canopy	Kay Park	Sitescapes	GoCharge!
Appeal	5	4	2	5	1
Price	1	4	5	Pending...	4
Durability	5	3	2	4	2
Promotes Renewable energy	5	4	5	2	5
Battery Storage	5	3	1	1	3
Charging Power	5	4	3	2	4
Total	26	22	18	14	19

Enerfusion Solar-powered Dok WON!

Solar-powered Trash Compactors

Big Belly Solar-powered trash compactor

Ecube Solar-powered trash compactor

Solar Powered Trash Compactor Comparison

	CleanCube	Big Belly
Appeal	5	5
Price	Pending...	5
Promotes Renewable energy	5	5
Battery Storage	5	5
Wifi Connection	Yes	Yes
Capacity	4	5
Total	19	25

Big Belly WON!

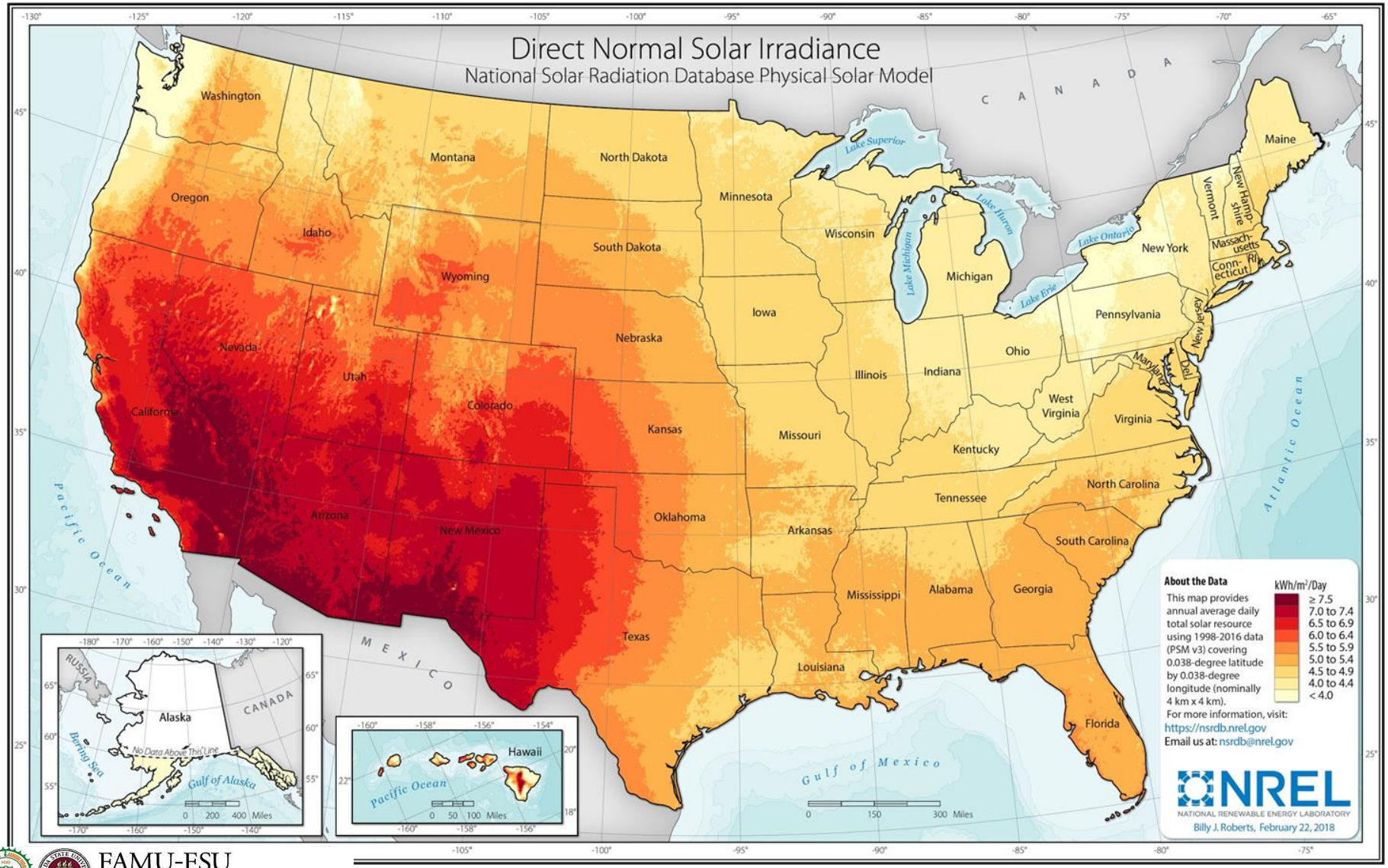
Final Selections

Big Belly trash compactor

Enerfusion Solar-powered charging Dok

Weather Model

United States irradiance Level

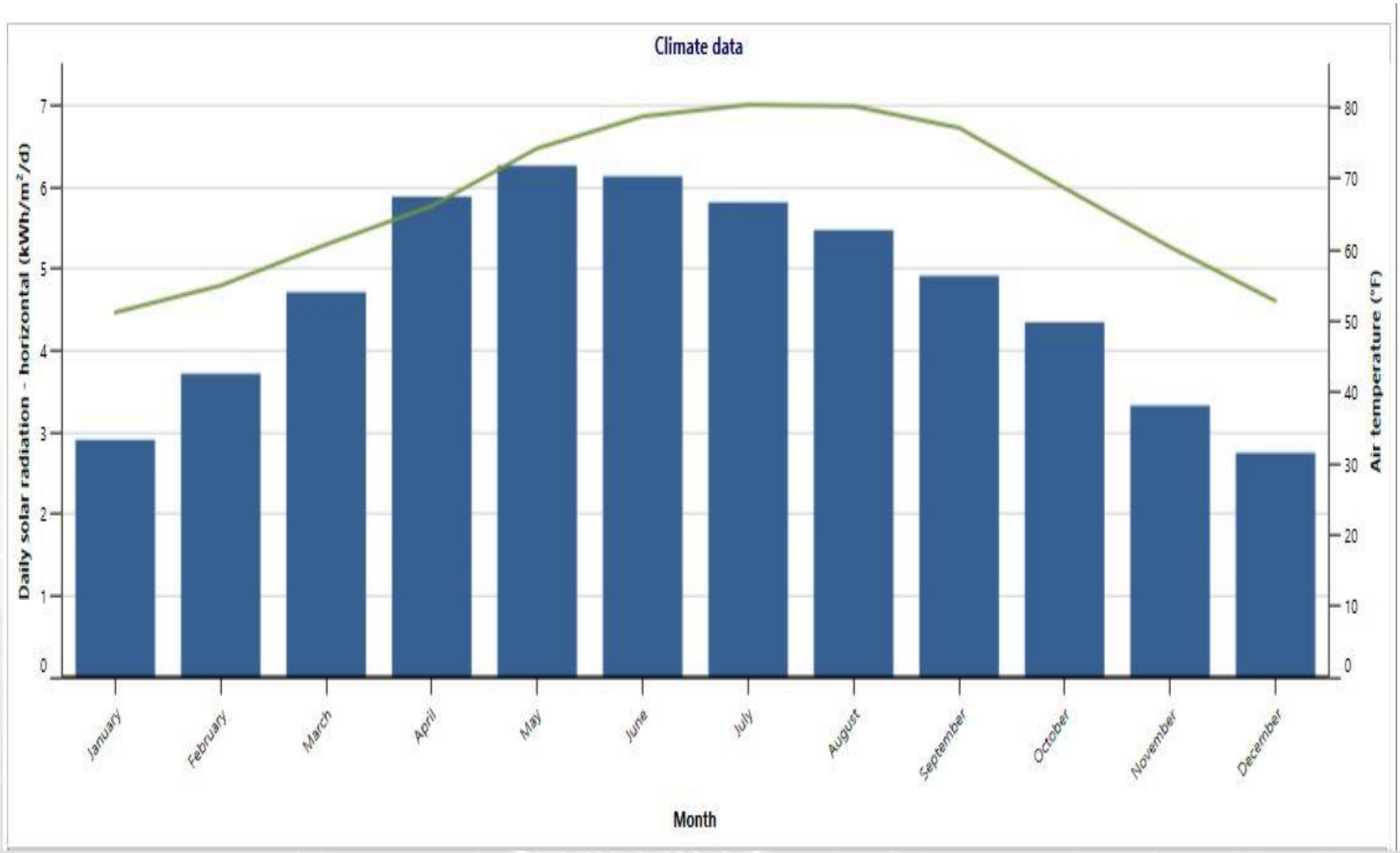


Climate data for the J.Lewis Hall Sr. Woodville Park

	Unit	Climate data location	Facility location	Source
Latitude		30.4	30.3	
Longitude		-84.3	-84.3	
Climate zone		3A - Warm - Humid		Ground+NASA
Elevation	m	21	8	Ground – Map
Heating design temperature	°F	28.9		Ground
Cooling design temperature	°F	93.6		Ground
Earth temperature amplitude	°F	27.7		NASA

Month	Air temperature	Relative humidity	Precipitation	Daily solar radiation - horizontal	Atmospheric pressure	Wind speed	Earth temperature	Heating degree-days 64.4 °F	Cooling degree-days 50 °F
	°F	%	mm	kWh/m²/d	kPa	m/s	°F	°F-d	°F-d
January	51.3	73.3%	114.39	2.91	101.9	2.6	53.1	407	39
February	55.0	71.6%	109.76	3.72	101.7	2.8	55.3	262	141
March	60.8	69.5%	130.51	4.72	101.6	2.9	60.5	112	335
April	66.2	68.6%	73.20	5.89	101.5	2.8	67.0	0	486
May	74.3	70.3%	72.23	6.27	101.4	2.6	75.5	0	753
June	78.8	76.5%	162.30	6.14	101.4	2.3	80.8	0	864
July	80.4	79.2%	181.66	5.82	101.5	2.0	82.3	0	943
August	80.2	79.4%	185.69	5.48	101.5	2.0	81.9	0	937
September	77.2	76.4%	121.80	4.92	101.4	2.5	78.5	0	815
October	68.7	73.8%	85.25	4.35	101.6	2.5	70.6	0	580
November	60.4	75.5%	75.90	3.33	101.7	2.5	62.2	119	313
December	52.9	75.0%	84.32	2.75	101.9	2.5	55.6	357	89
Annual	**67.3**	**74.1%**	**1,397.01**	**4.70**	**101.6**	**2.5**	**68.7**	**1,257**	**6,297**
Source	Ground	Ground	NASA	Ground	Ground	Ground	NASA	Ground	Ground
Measured at					m	10	0		

Weather Model For the J.Lewis Hall Sr. Woodville Park



Utility Data Model

- Old data is used to model current load usage in Woodville Park
- Key in forecasting load growth going forward
- Current work is understanding better the data being examined,

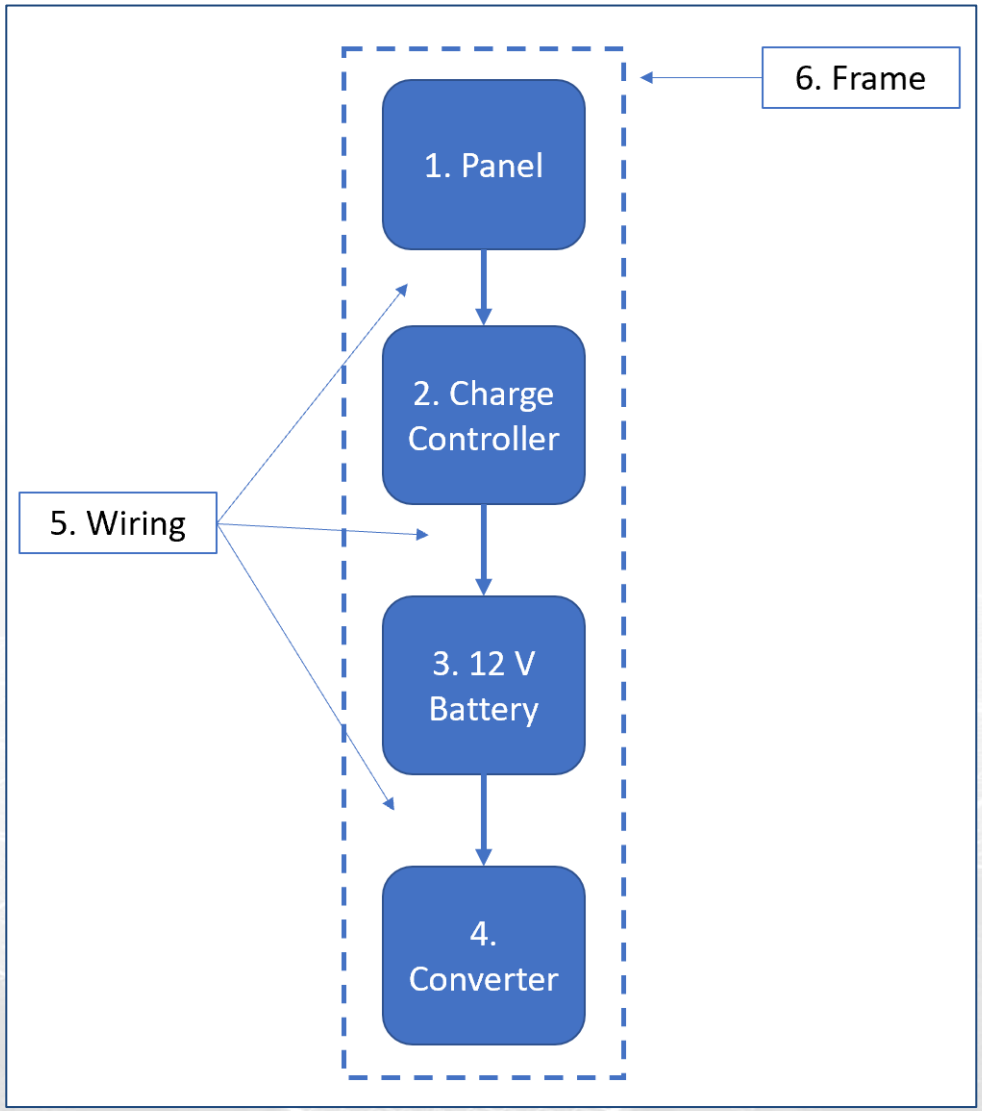
Funding Opportunities

1. Net Metering with Utility Provider
1. Federal/State Tax Incentives
1. State Renewable Energy Grant Opportunities
1. DSIRE Database

Design Requirements

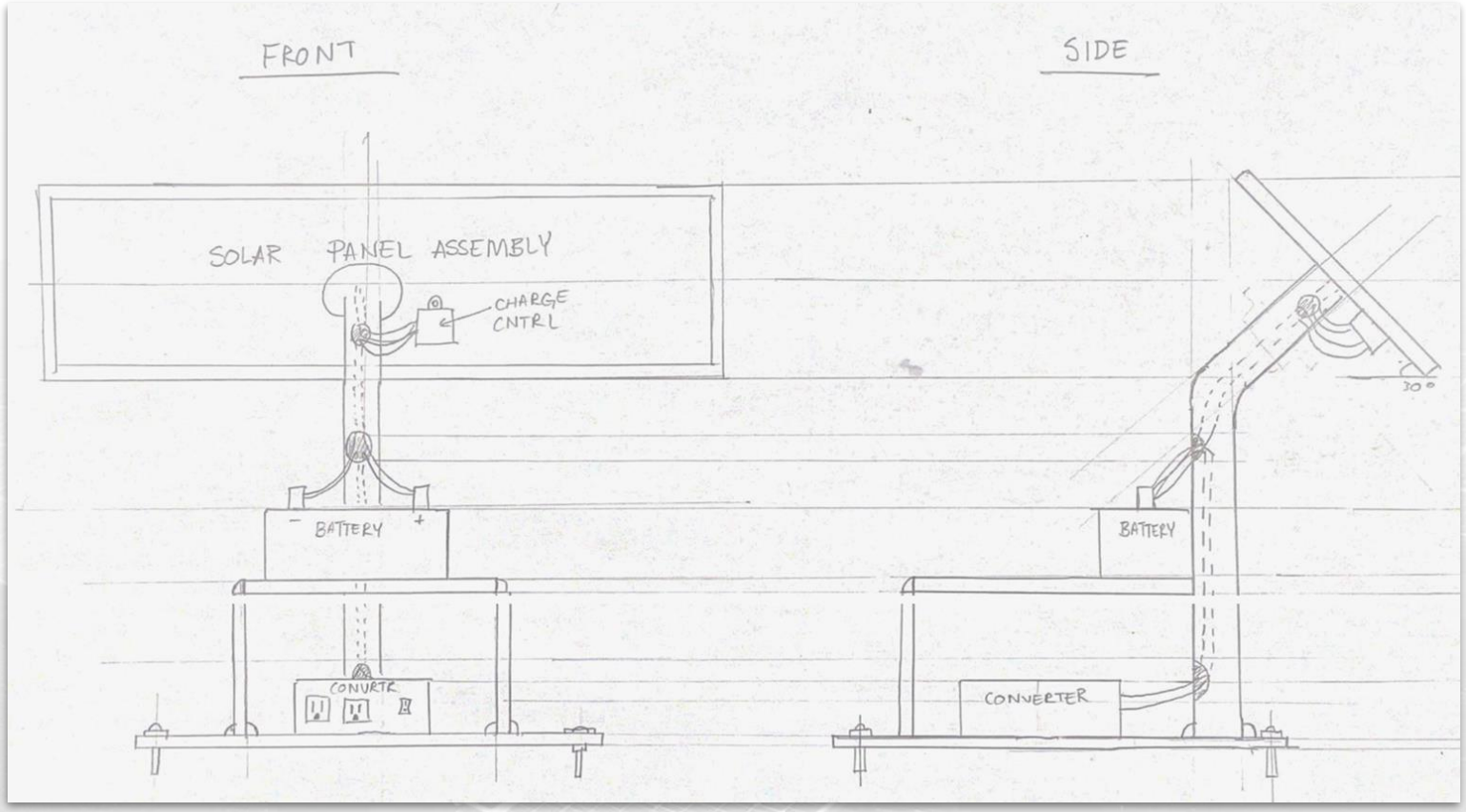
- Total cost <$1500 (<$1200 Target)
- All-weather
- Self-contained kit, attachable to existing picnic table
- Solar Powered with Battery
- Output 60Hz 120V outlet and 5V DC outlet (cell phone capable)
- Compiled into design packet:
  - Mechanical Assembly
  - Wiring Diagram
  - Bill of Materials

Functional Decomposition



Preliminary Design

We decided to add to our project a design for Leon County to assemble with ease a portable, self-contained solar charging station. It would use a kit assembly typically used for campers and RV's. Preliminary Concepts are shown below:



System Advisor Model

SAM

What is SAM?

- Free software created by NREL

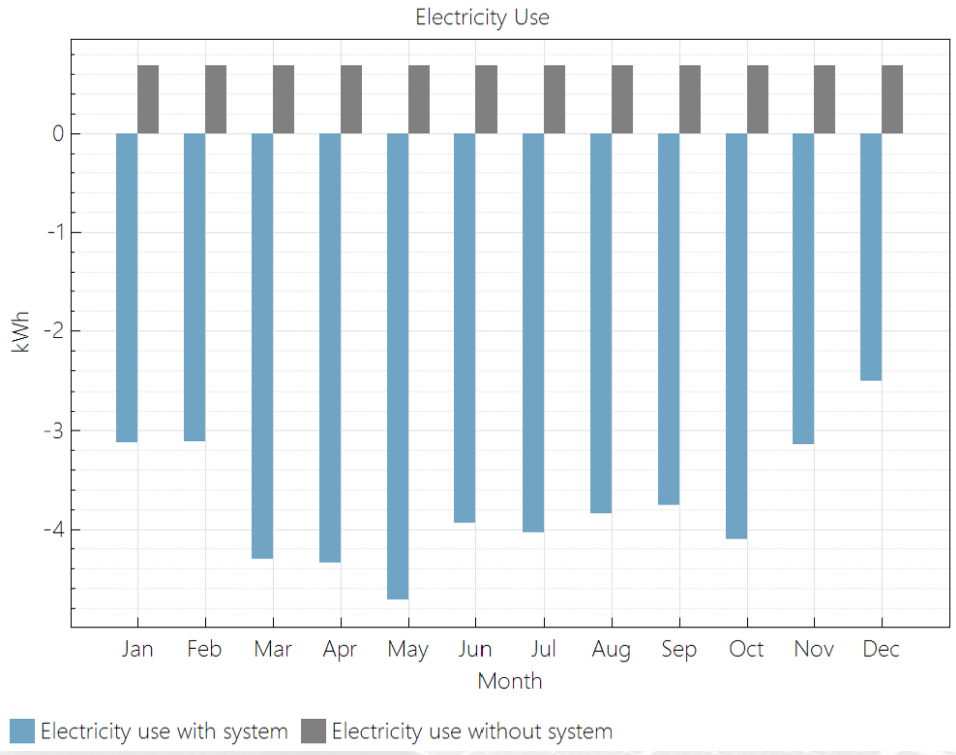
What does it do?

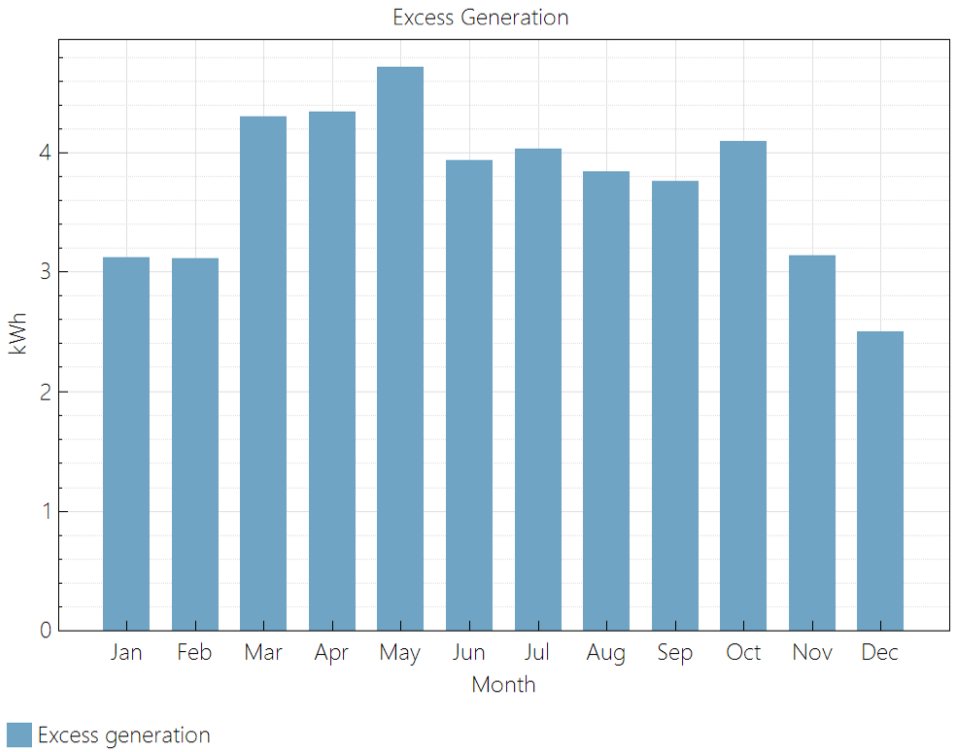
- Compare different renewable energy systems
- Display financial models.

How will it benefit team 306?

- Model prototype design
- Provide more information on vendor technology.

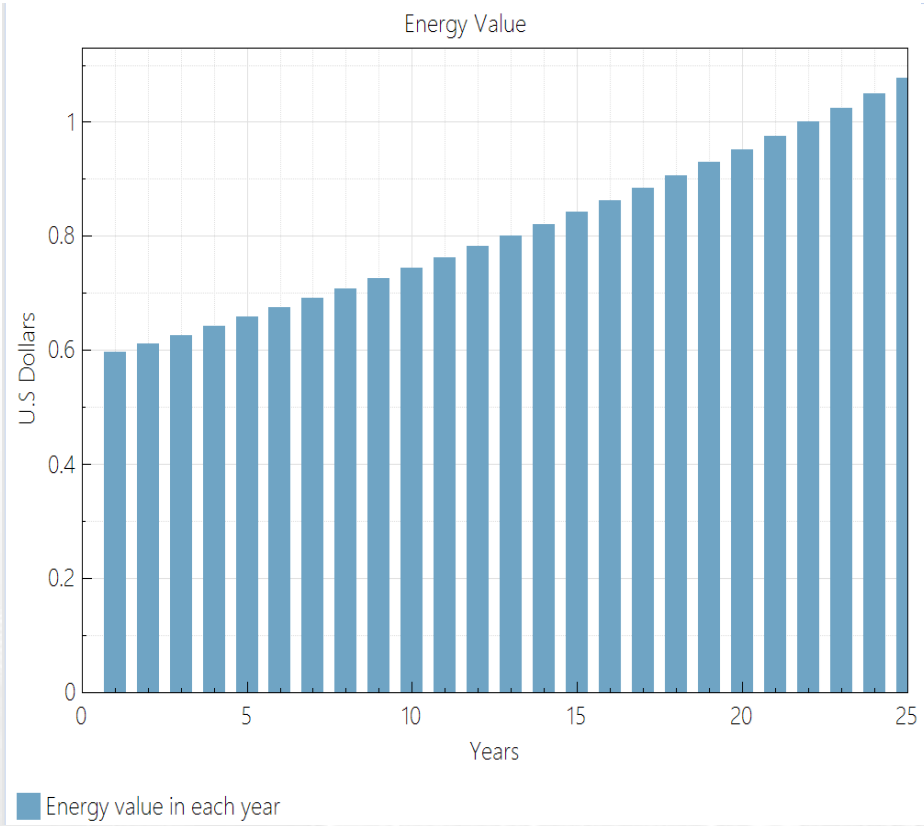
Prototype SAM Model (Energy)

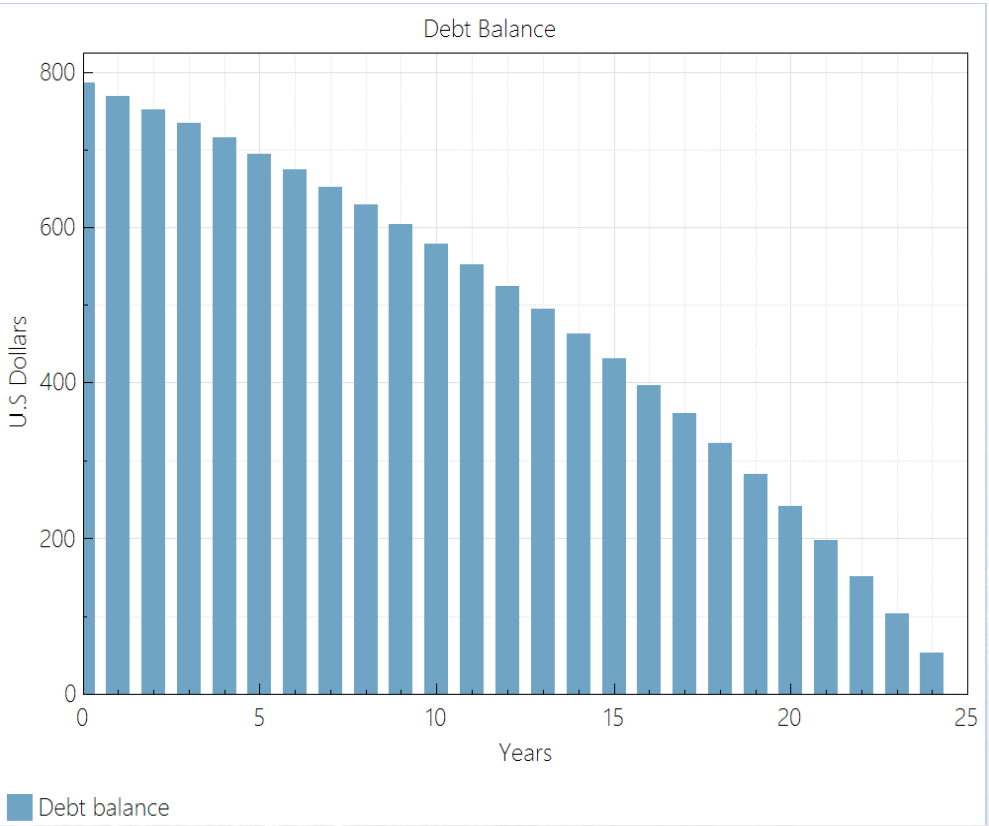




Assuming the system is used daily at a rate of 22Wh/day

Prototype SAM Model (Financial)





Total installed cost =$ 786.11, assuming labor takes 3 hours at a rate of $40/hr

Questions?