Leon County Energy Sustainability

Team 306

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Project Background: Leon County ISAP

- In 2018, The Leon County Board of Commissioners enacted the Integrated Sustainability Action Plan (ISAP) with ambitions to reduce their Greenhouse Gas Emissions by 30% in 2030.
- Goals Include:
  - Reduce kWh usage by 2%/yr.
  - Increase renewables 30% by 2030
  - Ensuring sustainable design for all facilities by 2021

Speaker: Samantha

How do we help?

- To meet these goals, they enlisted Team 306 to search for creative ways in their facilities and parks to:
  - Increase sustainability in County parks or facilities.
  - Promote sustainable initiatives and renewable generation to the public.
  - Provide an implementable plan of action to be carried out by the Leon County Office of Resource Stewardship and Sustainability.

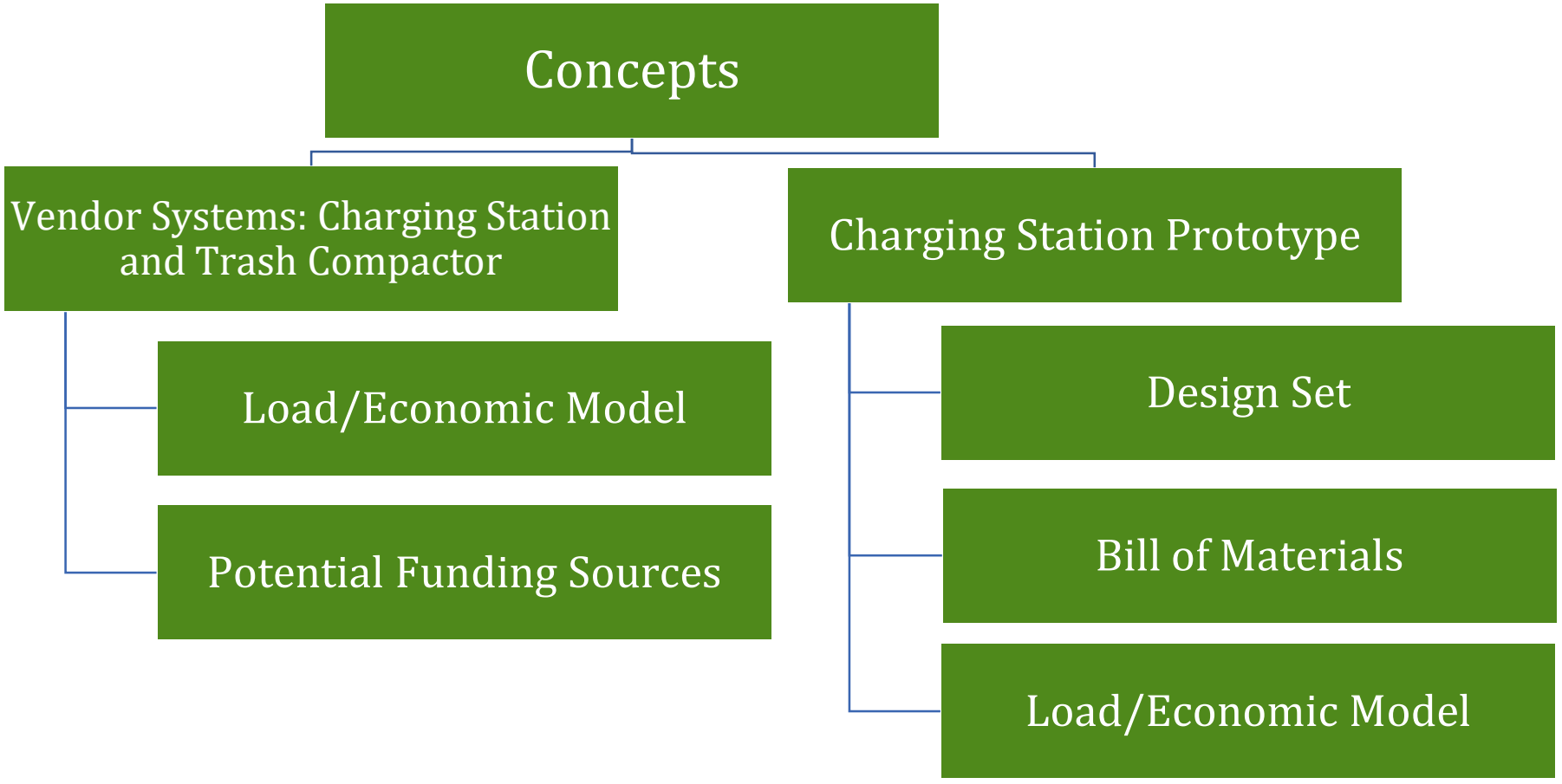
Speaker: Samantha

Site Location: J. Lewis Hall Woodville Park

- Initially had several locations to choose from:
  - Parks across Leon County
  - Leon County Courthouse
  - Leon County Facilities Management Building
- We Chose J. Lewis Hall Woodville Park to be the location for our Pilot Project and Analysis:
  - Social Interaction
  - Developed Playground, Picnic Area, Sports Facilities

Speaker: Jacob

Selected Concept



Speaker: Marwan

Comparison of Criteria

- Matrix contains criteria for product selection
- Promoting Renewable Energy was the most important
- Appeal was the least important

	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

Speaker: Sean

Gathering Data

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

Speaker: Sean

Comparison of Criteria

- Comparison of the criteria with the devices
- Enerfusion Solar-Powered Dok ranked highest
- Kay Park solar charging station ranked lowest

	Enerfusion Solar-Powered Dok	Enerfusion Solar-Powered Canopy	Kay Park	Sitescapes	GoCharge!
Appeal	5	4	2	5	1
Price	1	4	5	3	4
Durabilty	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	20	19

Speaker: Sean

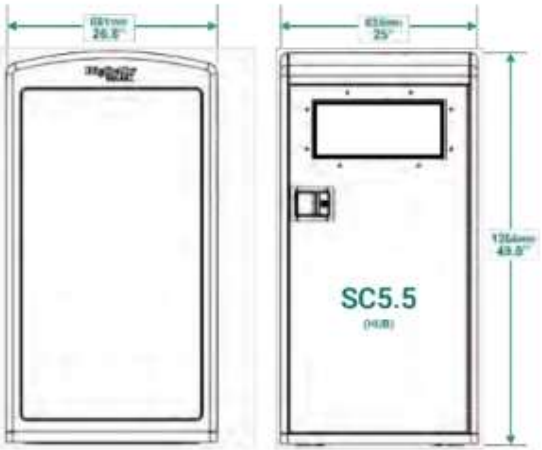
Comparison of Criteria

- Chart showing criteria compared with solar trash compactors.
- Big Belly trash compactor ranked highest.

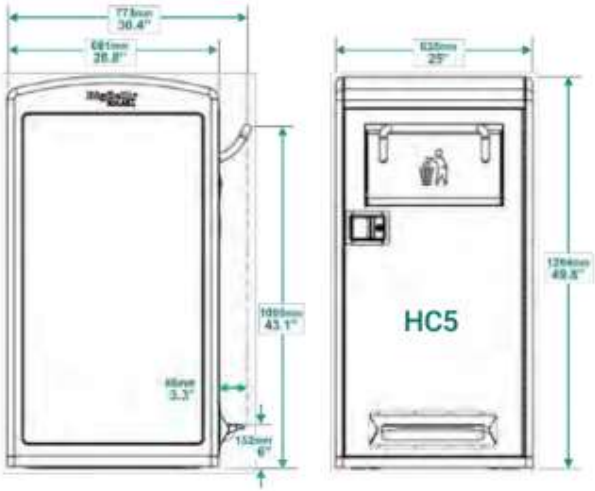
	CleanCube	Big Belly
Appeal	5	5
Price	4	5
Promotes Renewable energy	5	5
Battery Storage	5	5
Wifi Connection	Yes	Yes
Capacity	4	5
Total	23	25

Speaker: Sean

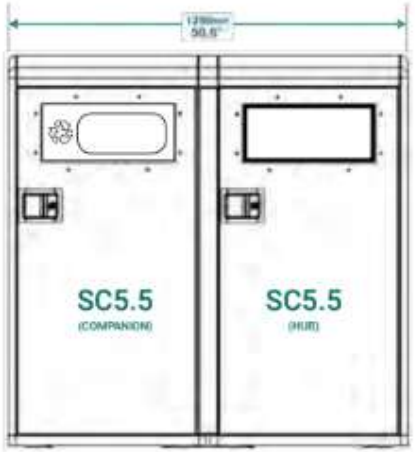
Big Belly Models



SC5.5 Single Station
Approximately 150 lbs (68kg)



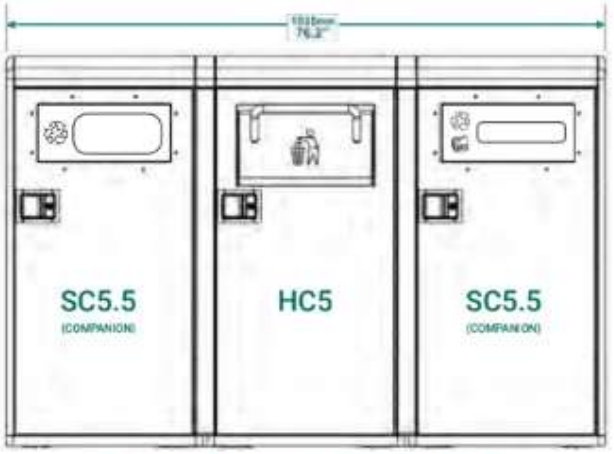
HC5 Single Station
Approximately 270 lbs (122 kg)



SC5.5/SC5.5 Double Station
Approximately 294 lbs (133 kg)

HC5/SC5.5 Double Station
Approximately 414 lbs (188 kg)

HC5/HC5 Double Station
Approximately 540 lbs (245 kg)



HC5/SC5.5/SC5.5 Triple Station
Approximately 558 lbs (253 kg)

Vendor Systems: Big Belly Trash Compactor

- Wi-Fi capable
- Covered maintenance
- Custom wrapping
- Cost: $200-$400/month
- Uses 40-W panel

Speaker: Sean

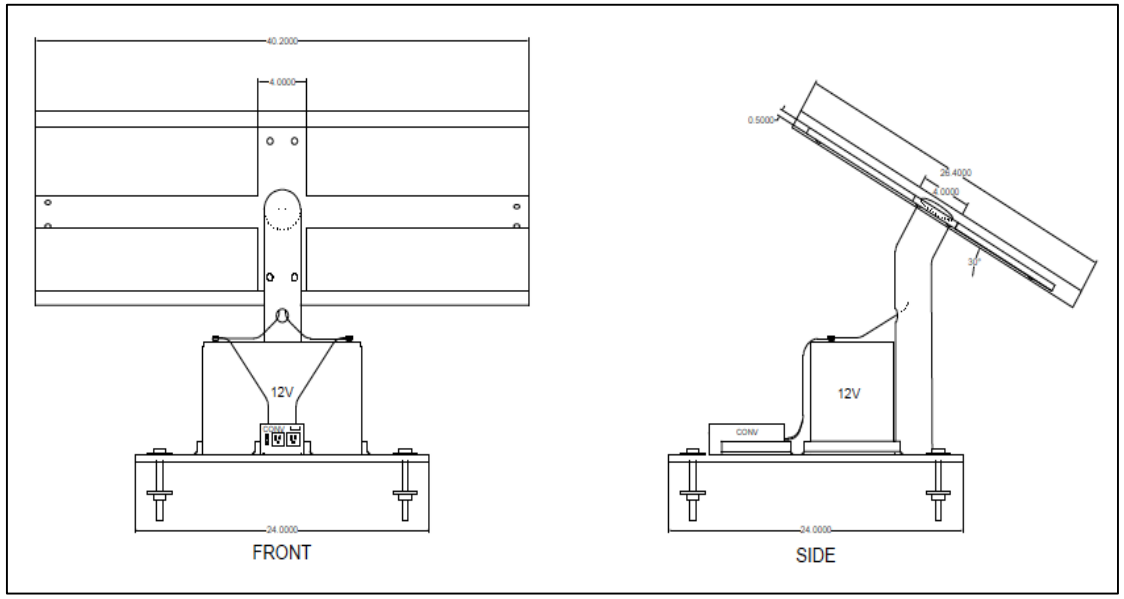
Vendor Systems: Enerfusion Charging Station

- Wi-Fi capable
- Picnic Table with covered canopy
- 4 USB and 4 GFI outlets
- Cost: $14,174.59
- Uses 3-65 W panels and 1-100 W panel

Speaker: Sean

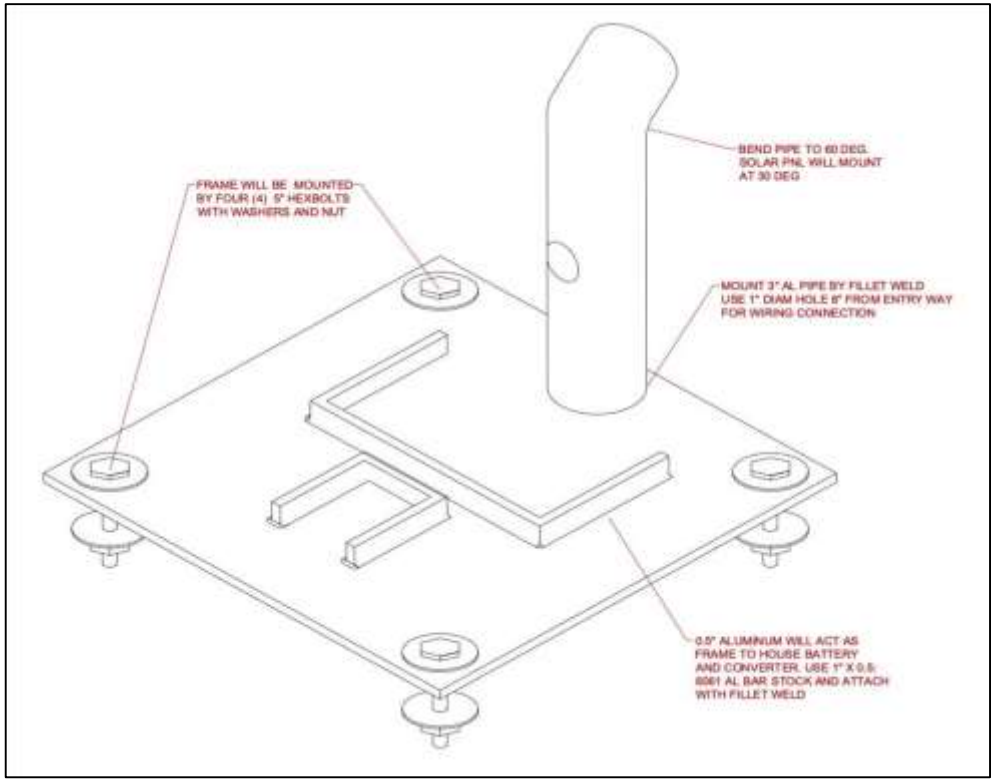
Prototype Charging Station

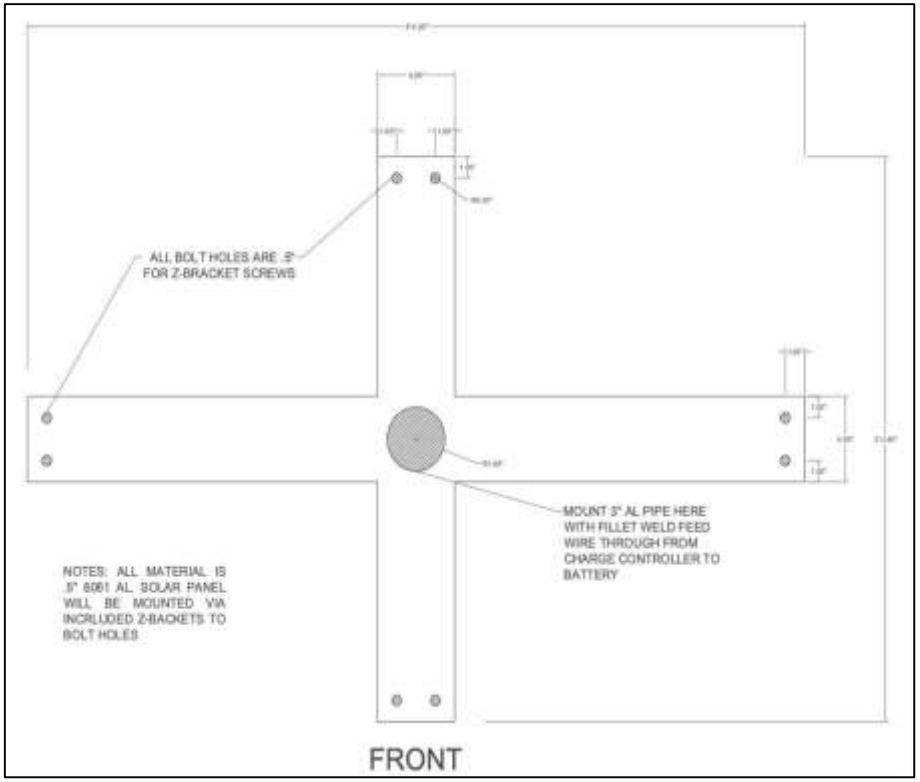
- Self Contained-Charging Station
- Includes Solar-Panel kit with:
  - 1-110 W Solar Panel
  - 11 A Charge Controller
  - 300 W Converter/Inverter
  - 1 USB and 2 GFI 120VAC Outlets



Speaker: Jacob

Prototype: Frame Design





Speaker: Jacob

Prototype: Bill of Materials

Part #	Vendor/Supplier	Description	Qty	Units	Picture	Unit Cost	Cost
53110	Nature Power	110W Panel kit w/ Charge Controller, Panel, mounting z-brackets, and inverter	1	1		$ 220.00	$ 220.00
RBT100G	Renogy	Hybrid GEL battery 12V, 100Ah	1	1		$ 246.00	$ 246.00
2HGR7	GRAINGER	Aluminum Plate 24"x24"	1	1		$ 295.80	$ 295.80
5GUL0	Rigid	Aluminum Conduit 3" Diam 10' length	1	1		$121.28	$ 121.28
67312	Hillman	1/2" x 5" Hex Bolt	4	1		$2.07	$ 8.28
67342	Hillman	1/2" Hex Nut	4	1		$0.41	$ 1.64
63449	Hillman	0.531" Flat Washer	4	1		$0.36	$ 1.44
61817	Hillman	1/2" Split Lock Washer	4	1		$0.28	$ 1.12
20670	Aluminum Bar	1/2" x 8" Aluminum Rectangle Bar 3'	1	1		$87.00	$ 87.00
1171	Aluminum Bar	1/2" x 4" Aluminum Rectangle Bar 6'	1	1		$ 76.49	$ 76.49
	Total		**22**				**$ 1,059.05**

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Speaker: Jacob

System Advisory Modeling (Sam)

- Free modeling software
- Compares different renewable options
- Builds financial models
- Shows effects of implementing vendor technology and prototype

Speaker: Chris

Load Assumptions

Charging Station assumes to provide power for 1 laptop charger (rated at 19V and 3.42A) and 2 cell phone chargers (rated at 5V and 1A). We are assuming 4 hours operation for the Laptop charger and 3 hours for the cell phone charger:

$$P_{LAPTOP} = 19\,V_{DC} * 3.42\,A_{DC} = 64.98\,W$$

$$E_{LAPTOP} = 64.98\,W * 4\frac{hr}{day} = 260\frac{Wh}{day}$$

$$P_{CELL} = 5\,V_{DC} * 1\,A_{DC} = 5\,W$$

$$E_{CELL} = 5\,W * 3\frac{hr}{day} * 2 = 30\frac{Wh}{day}$$

$$E_{TOTAL} = E_{LAPTOP} + E_{CELL} = 260\frac{Wh}{day} + 30\frac{Wh}{day} = 290\frac{Wh}{day} \approx 8.7\frac{kWh}{month}$$

Speaker: Chris

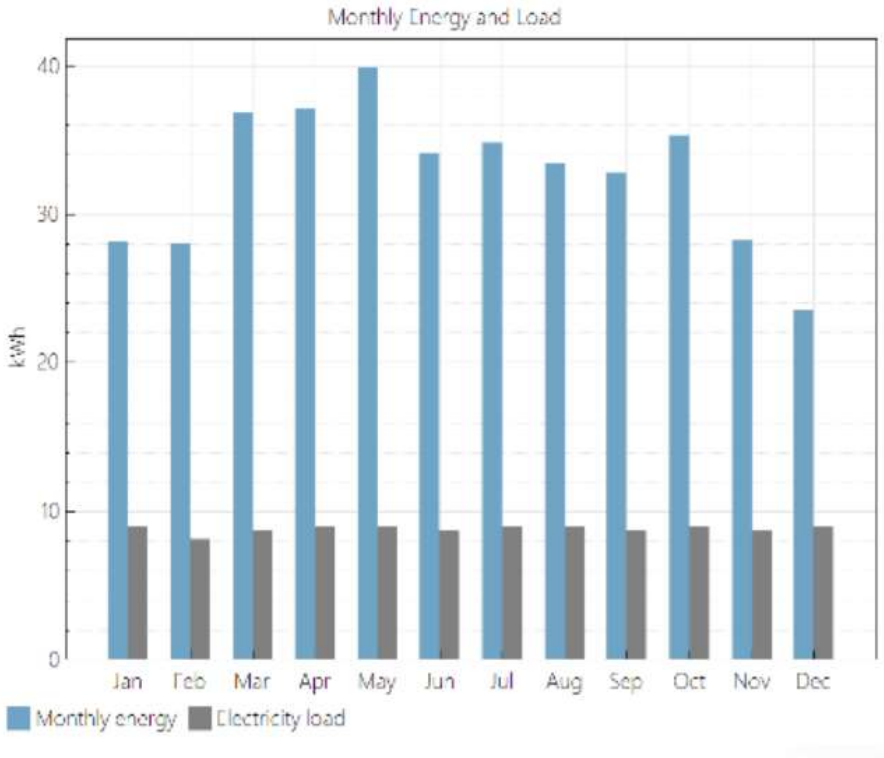
Load Assumptions

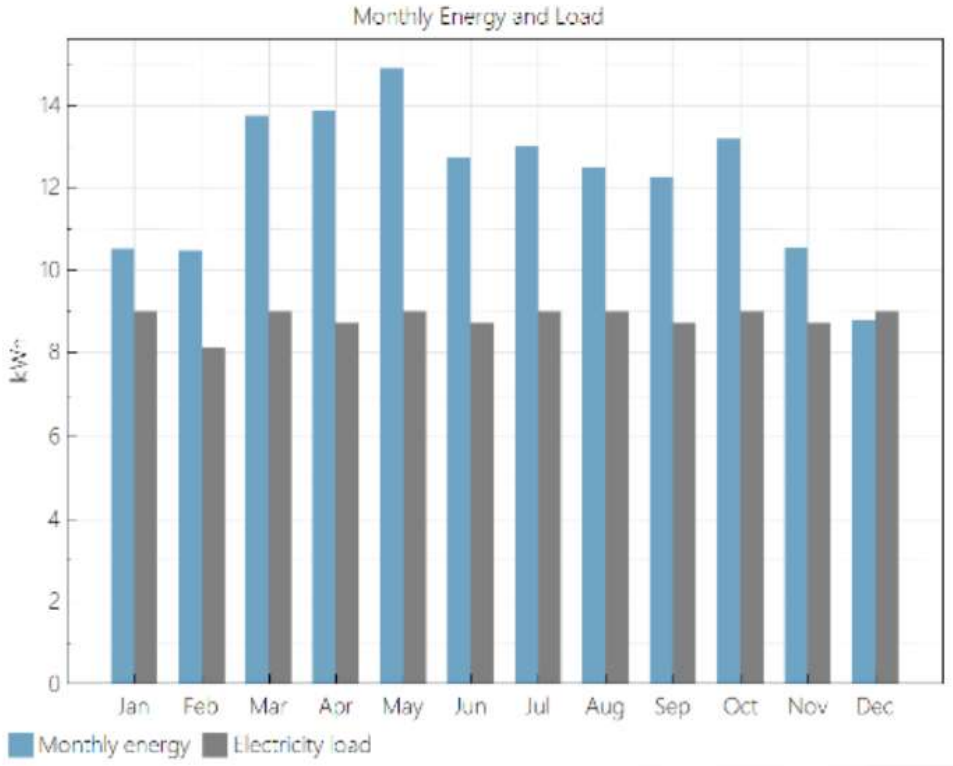
Big Belly will provide power to the compactor and a transmitter. The compactor runs off of a 20 watt DC motor. From FAMU case model we will be assuming 1 compaction per day.

$$(20Wh/day) * 31 = 0.62\ kWh/month$$

Speaker: Chris

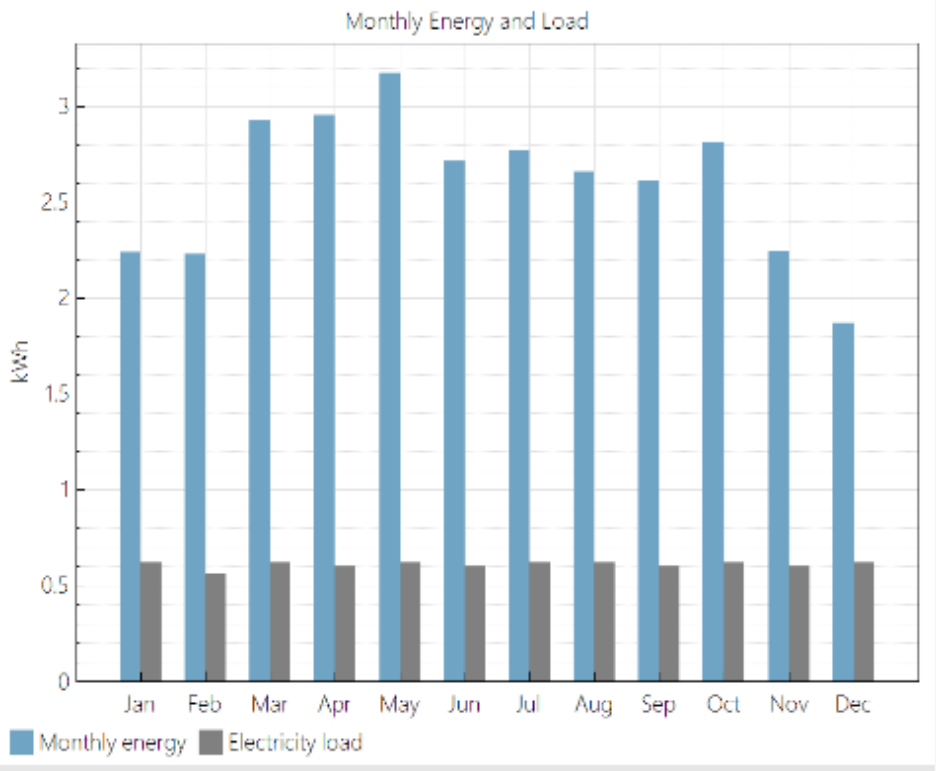
Enerfusion Charging Station VS Prototype

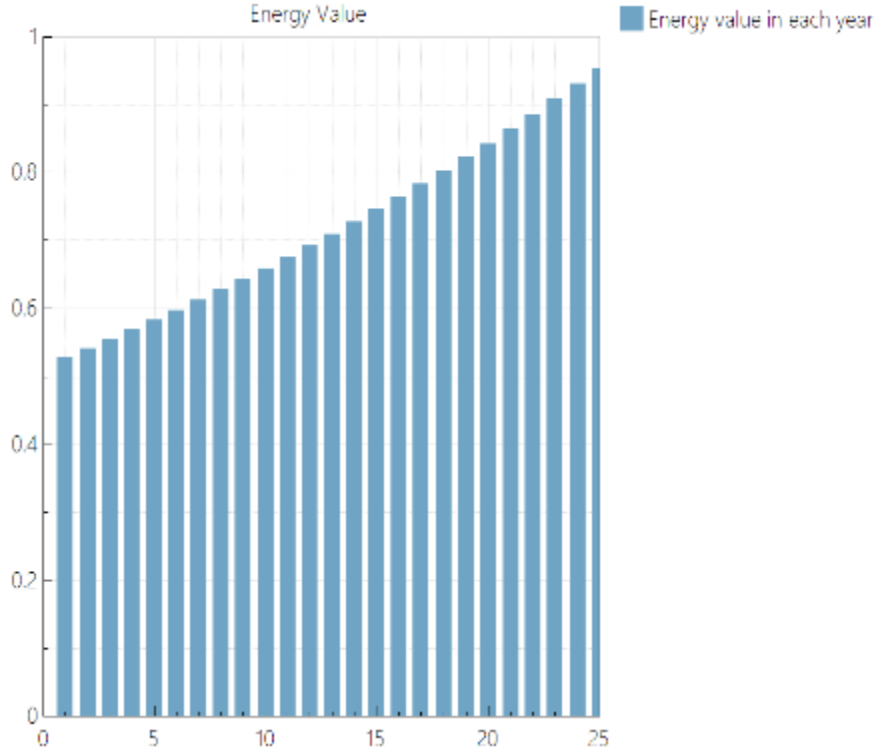




Speaker: Chris

Modeling Results: Big Belly Trash Compactor





Speaker: Chris

Potential Future Work

- Funding Sources: Grants and Tax Incentives
  - Florida Department of Agriculture Grants
  - DSIRE Database
- Net Electric Metering
  - Potential for added economic benefits in adding Renewable Energy
  - Currently unable due to pricing agreements
- Potential Design Modifications
  - Weather-proofing
  - Added safety features

Speaker: Marwan

What did we learn?

- Implementing Renewables
  - Modeling potential systems
  - Designing based off Load Requirements

- Communication
  - Working with Vendors, Suppliers
  - Working in the Public Sector
  - Bridging the gap between technical and nontechnical

Speaker: Jacob

Questions?