Solar Powered Charging Dock: Sustainability

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Background Information

- Solar Charging Dock:
  - Provides renewable energy source for charging electric personal transportation vehicles
- Website:
  - https://solarchargingstation.github.io/web

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Progress and Materials Used

- Progress:
  - Components being shipped
  - Structure being built
  - Already in process of programming and designing base structure
- Materials:
  - Solar panel
  - Wood for structure
  - Batteries
  - 2 microcontrollers & Raspberry Pi

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Investment

- Money Spent (rounded for convenience):
  - **Structure**: $120
  - **Solar Panel**: $170 (provided)
  - **Components**:
    - pi $40 (provided)
    - Arduino Uno $20 (provided)
    - High-powered Simple Motor Controller $60
    - Linear Actuator $140
      - mounts $40

Total: **$590**

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Social Sustainability

- Public view of solar panels is mostly positive, optimistically resulting in good outlook from public.
- Will get public more involved in the use of renewable resources.

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Social Sustainability Cont.

- Increasing popularity of eScooter Transportation.
- Can be seen as an add on to any home.
- Place to store eScooter.
  - Keeps out of buildings
  - Safely lock up scooter
  - Charge overnight
  - Place to step out of the rain

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Environmental Sustainability
(solar panels)

Pros

- Renewable energy source
- Made mostly of wood and reusable/recyclable parts
- No emissions

Cons

- Production of solar panels can produce environmental waste
- Can be expensive
- Like some batteries, solar panels can be harmful waste if disposed of improperly

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Economic Sustainability

- The project is expected to cost an upwards of $700-800 after more parts have been ordered.
- In statesboro, cost of power is $0.10 per kW*hr
  - The solar panel we use produces 100W
  - 100W * hr = 0.1 kW*hr
  - The average amount of sunlight per day across the globe is 12 hrs.
  - At a single solar panel it would take roughly 15.98 years for project to pay itself off.

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Economic Sustainability (cont.)

0.01*n*12*d = 700 + 170*(n-1)

n = [number of solar panels]

d = [days to meet payoff]

Number of solar panels	Years to pay off
1	15.98
2	9.931
3	7.914

- continuing this trend, it would be smartest to invest in 2 solar panels because that is where the largest jump is.

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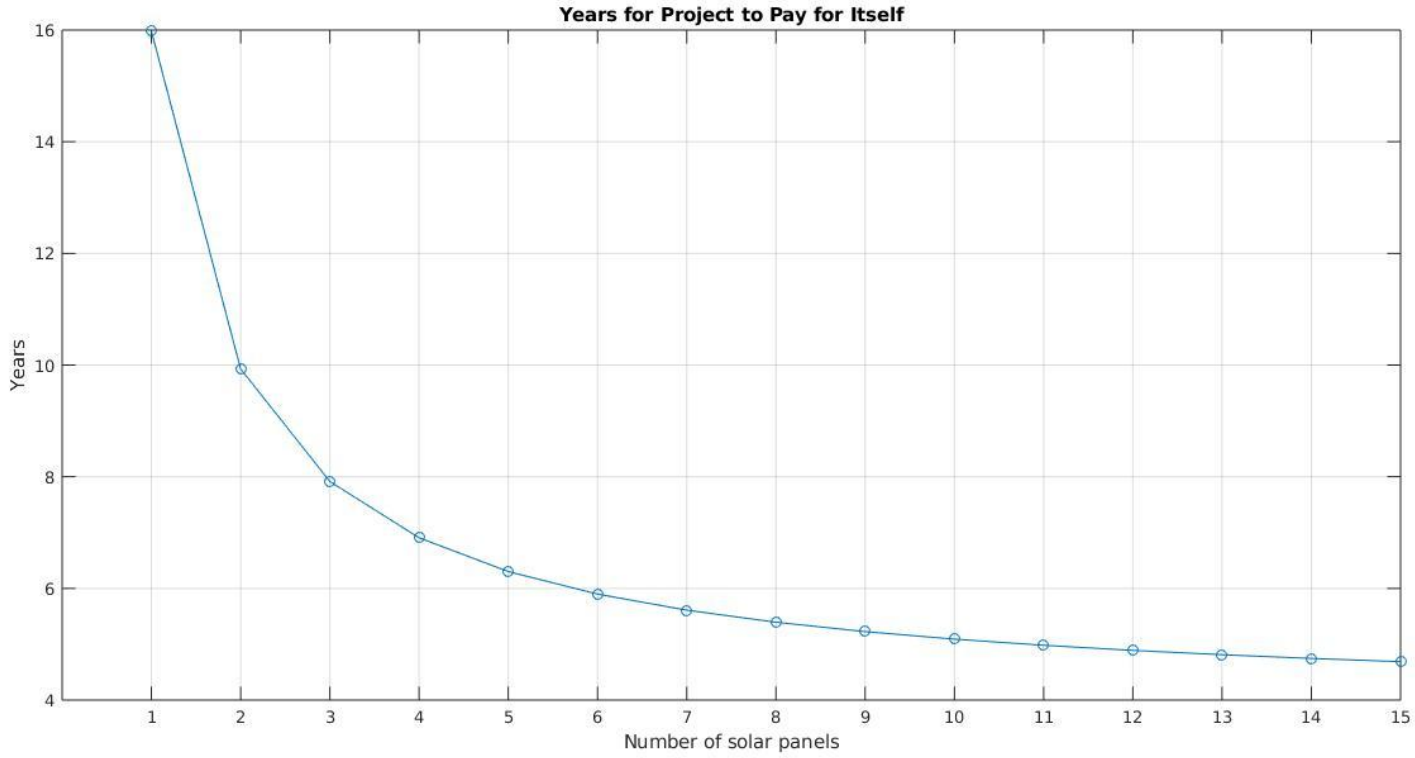
Economic Sustainability (cont.)



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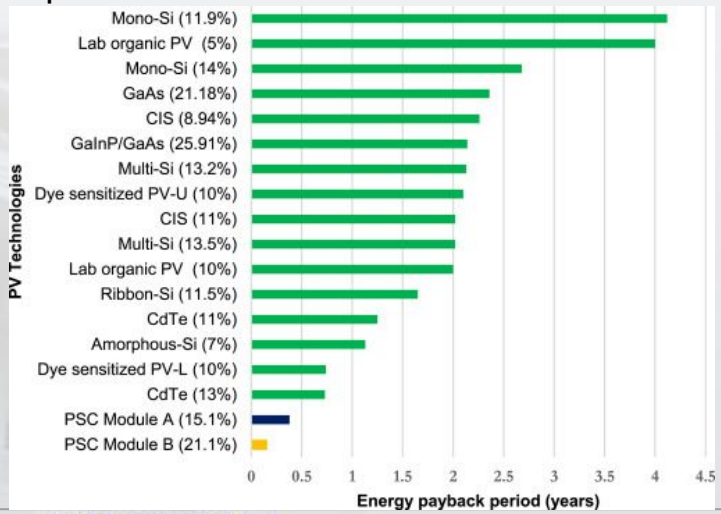
Solar Panel Payback Period(General)

Environmental Cost Refund

6-12 Months

Time

To pay back the environmental costs of production such as emission in the process of production.

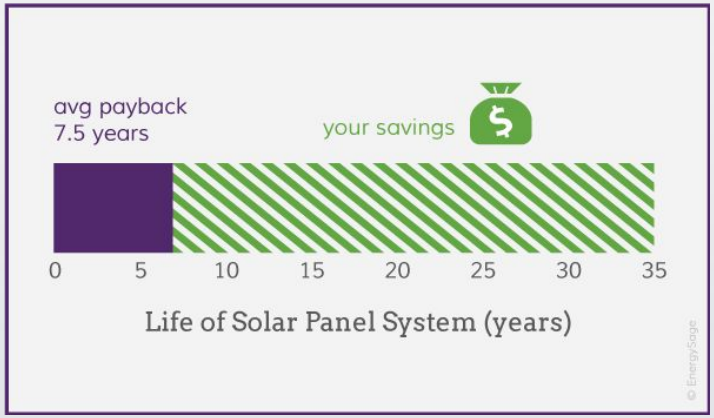


Economical Cost Refund

7-8 Years

Time + Financial Benefits

To pay back initial investments



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Solar Panel Payback Period(cont.)

Calculating the Economic Payback Period:

1. Gross Cost of Solar Panel System
2. Starting Incentives
3. Energy Use/Generation
4. Additional Incentives

1 can vary on size of the instillation and installers of the project

2 considers tax breaks and rebates you can get from installing a solar system. Federal investment tax credit allows you to deduct 30% of the cost of your system from your taxes

3 is calculated by comparing monthly use to generation which can be calculated to annual savings per year.

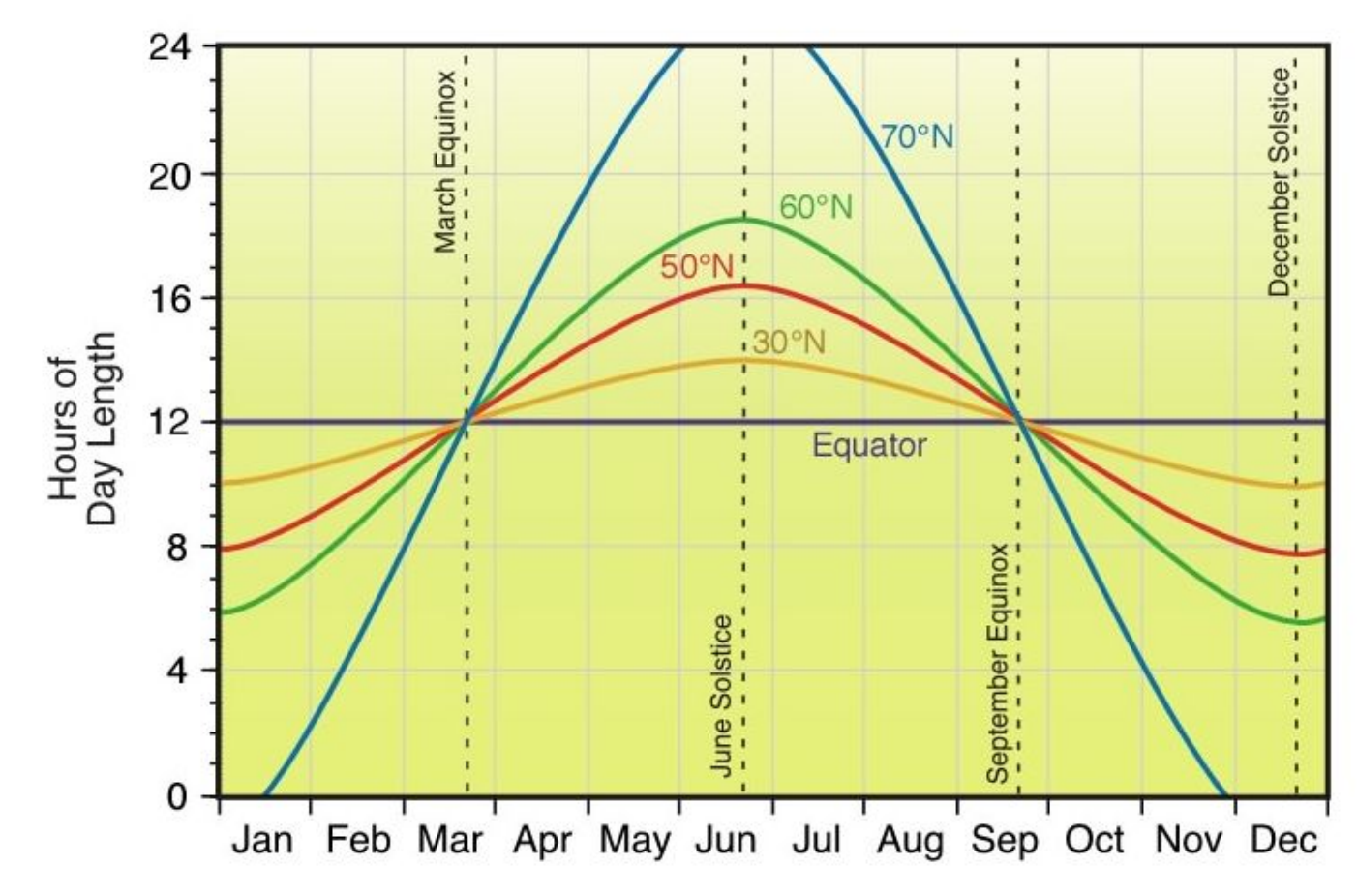
4 can be any other incentives that can come in as credit so help pay off the cost.

Payback Period = (1-2)/ (3+4)

1-2 being the real cost of the solar system , and 3+4 being the real annual benefits of the solar system.

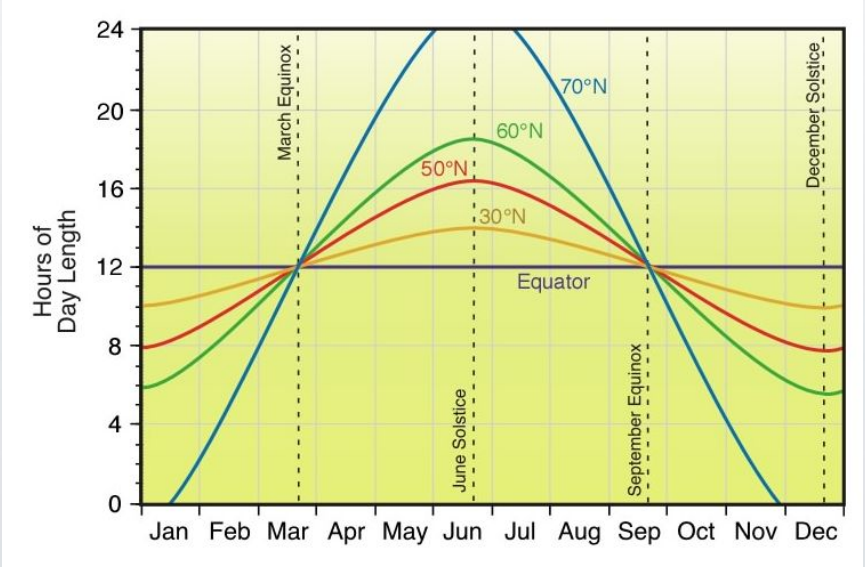
Regional Sustainability

Sunlight throughout year [1]



Regional Sustainability (cont.)

- Increased distance from equator produces greater change in sunlight exposure throughout year.
- Statesboro is roughly 32°N



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Questions?

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References

[1] http://www.physicalgeography.net/fundamentals/6i.html

[2] https://news.energysage.com/understanding-your-solar-panel-payback-period/

[3] https://en.wikipedia.org/wiki/Social_sustainability

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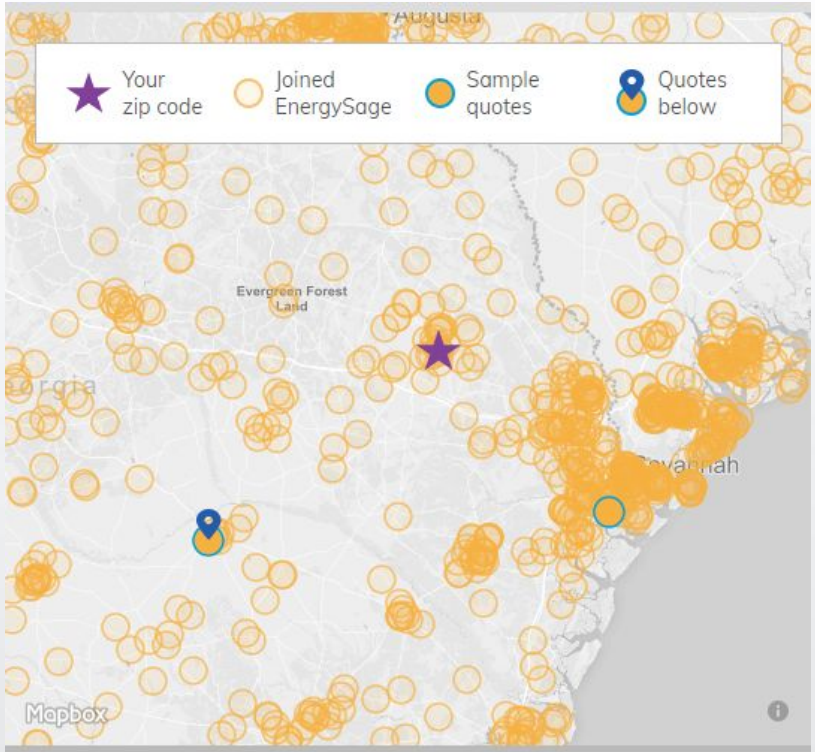
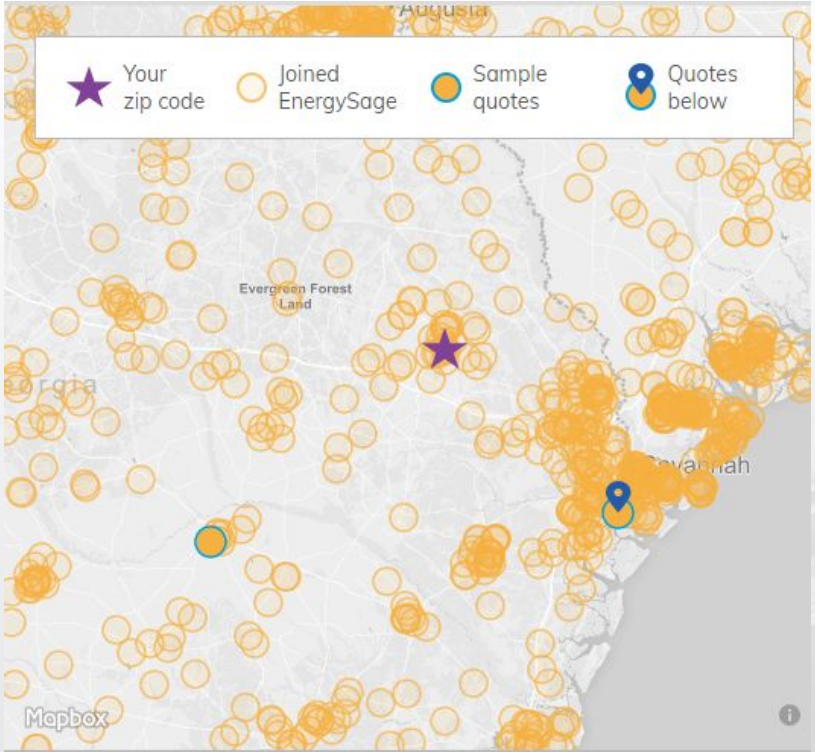


This Hazlehurst home received quotes from 3 installers

	Installer 1	Installer 2	Installer 3
Payback period	5.5 years	6.6 years	5.5 years
20-year savings	$67,479	$59,853	$129,093
Financing options	Cash	Cash	Loan, cash



This Savannah home received quotes from 3 installers

	Installer 1	Installer 2	Installer 3
Payback period	12.4 years	11.8 years	12.6 years
20-year savings	$9,090	$8,461	$13,020
Financing options	Loan, cash	Cash	Loan, cash