# 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

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**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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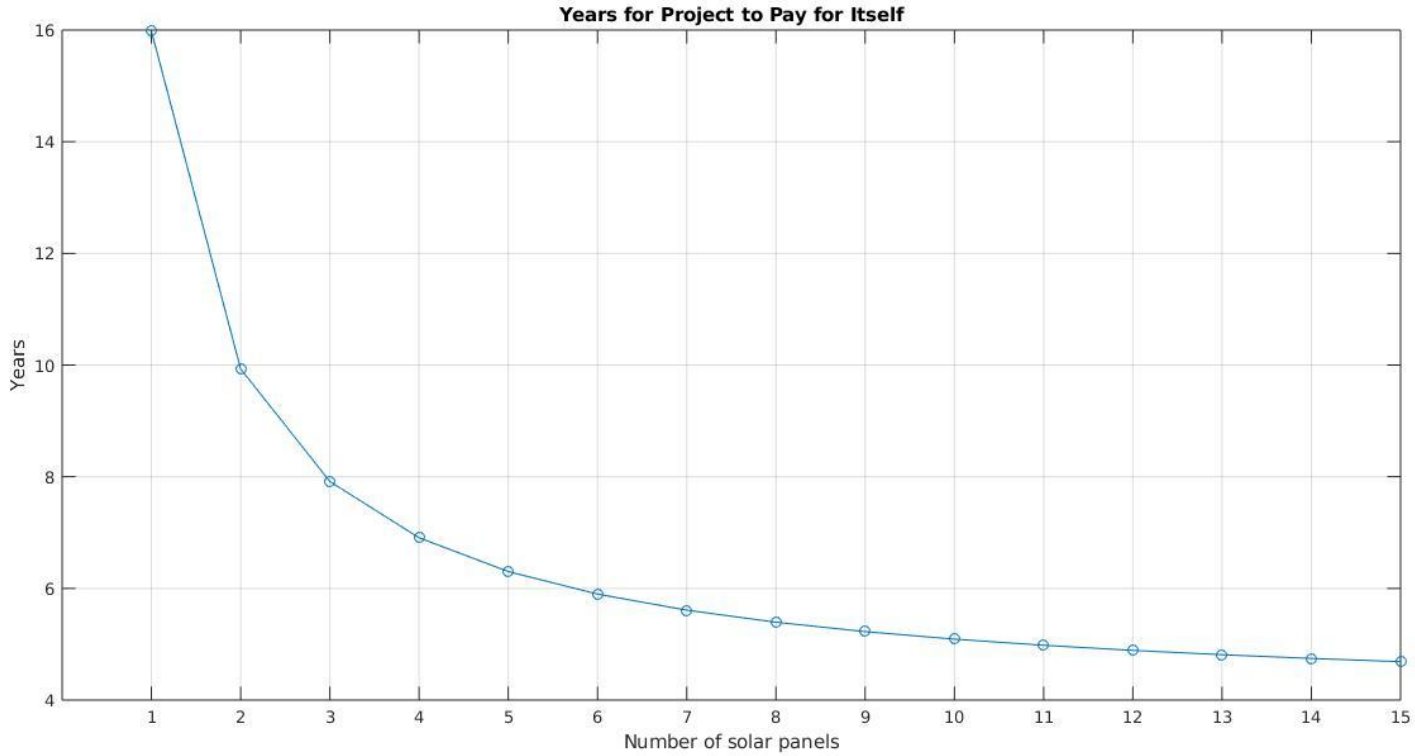
# Economic Sustainability (cont.)

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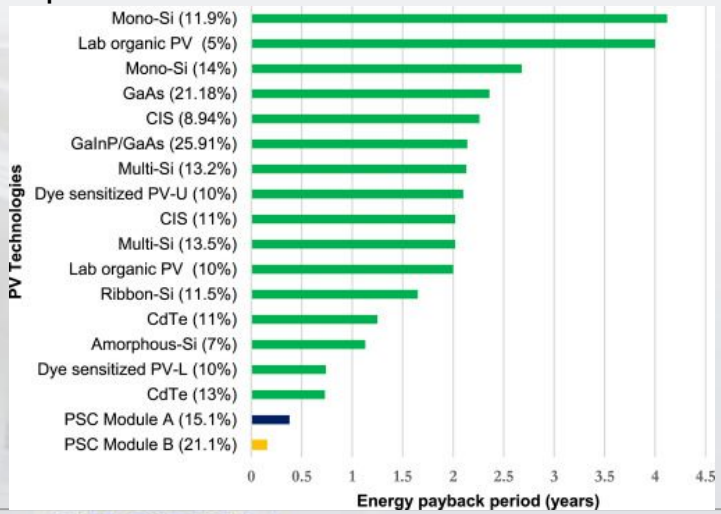
# Solar Panel Payback Period(General)

## Environmental Cost Refund

6-12 Months

Time

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

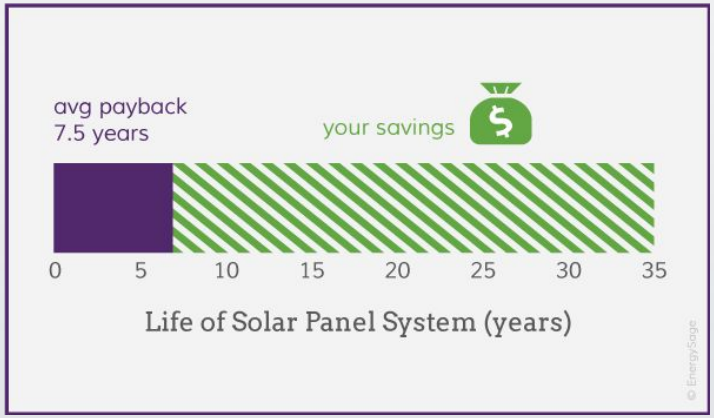



## Economical Cost Refund

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.

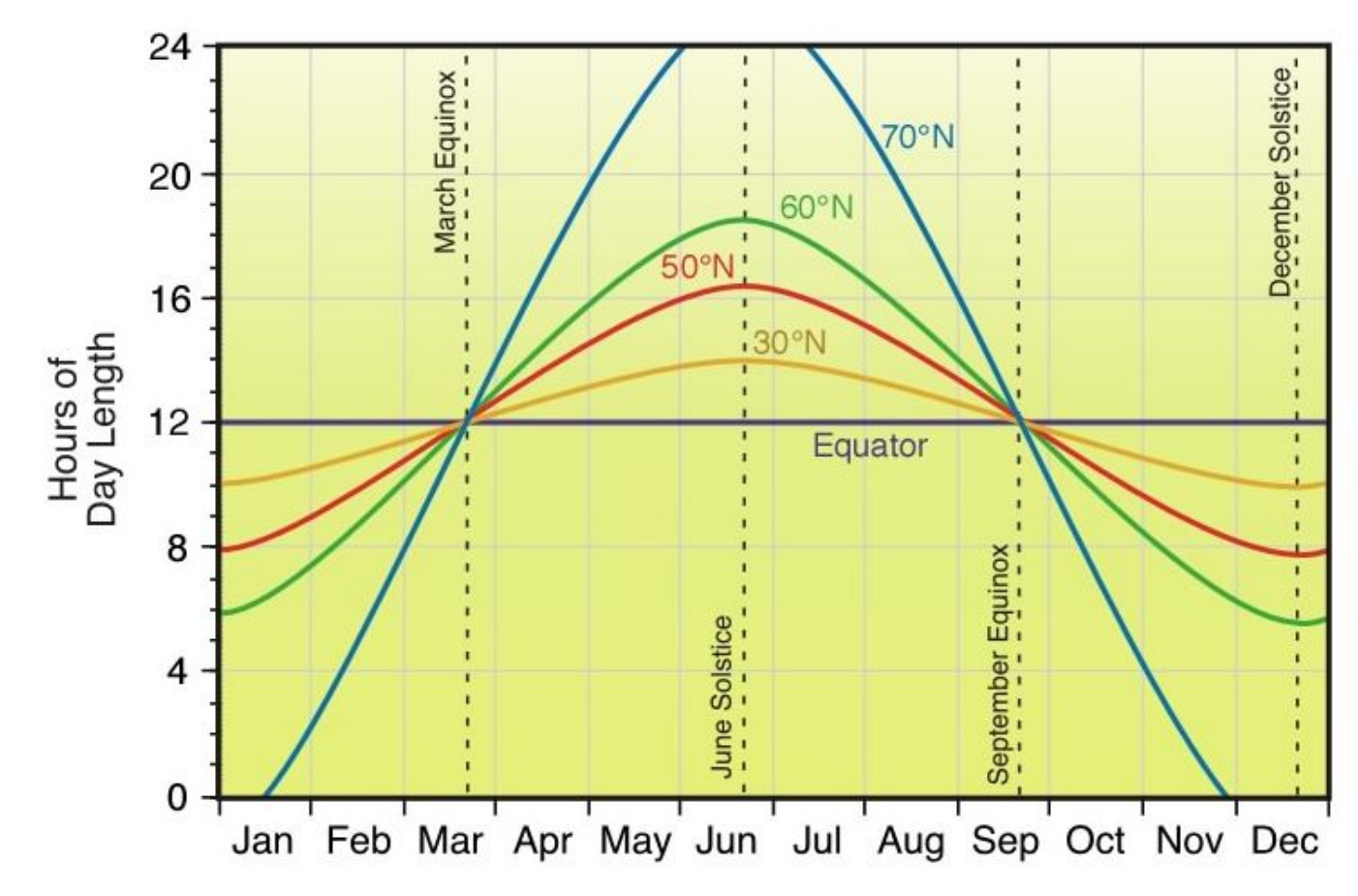
4 can be any other incentives that can come in as credit so help pay off the cost.

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.

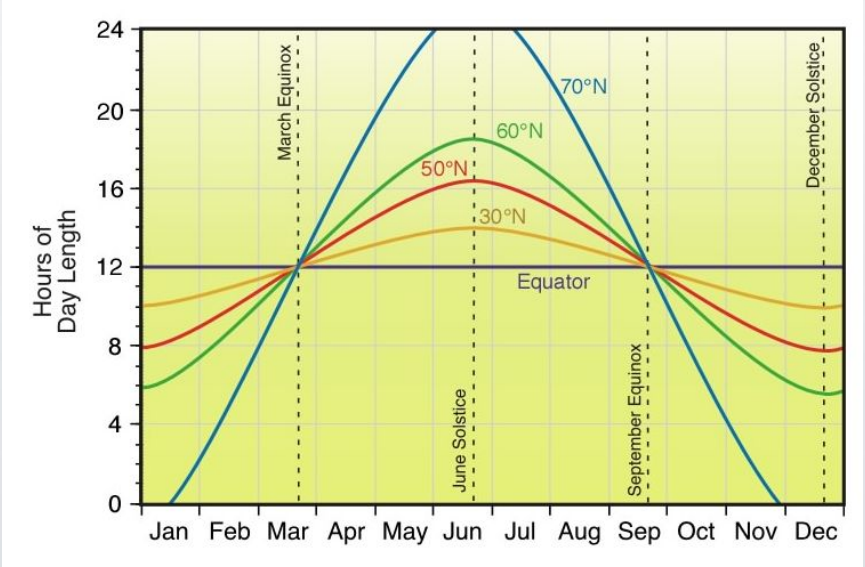
# Regional Sustainability

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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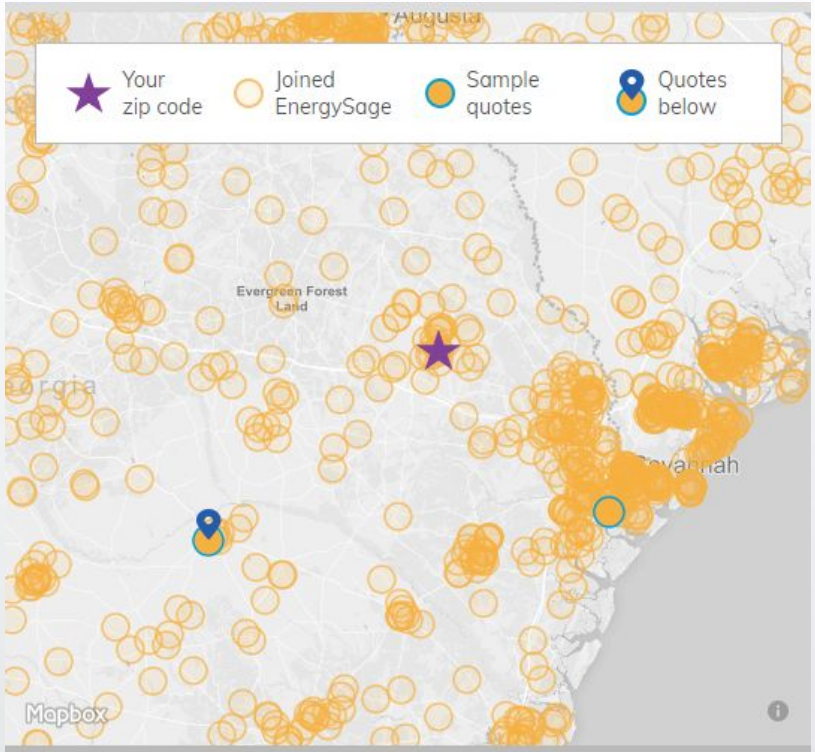
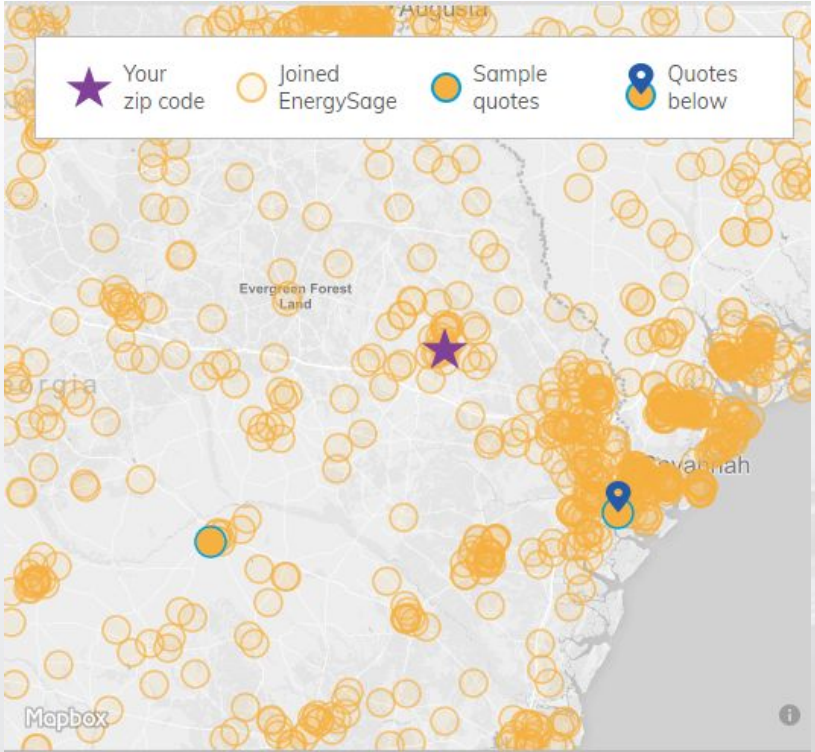



**This Hazlehurst home received quotes from 3 installers**

| | 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 |