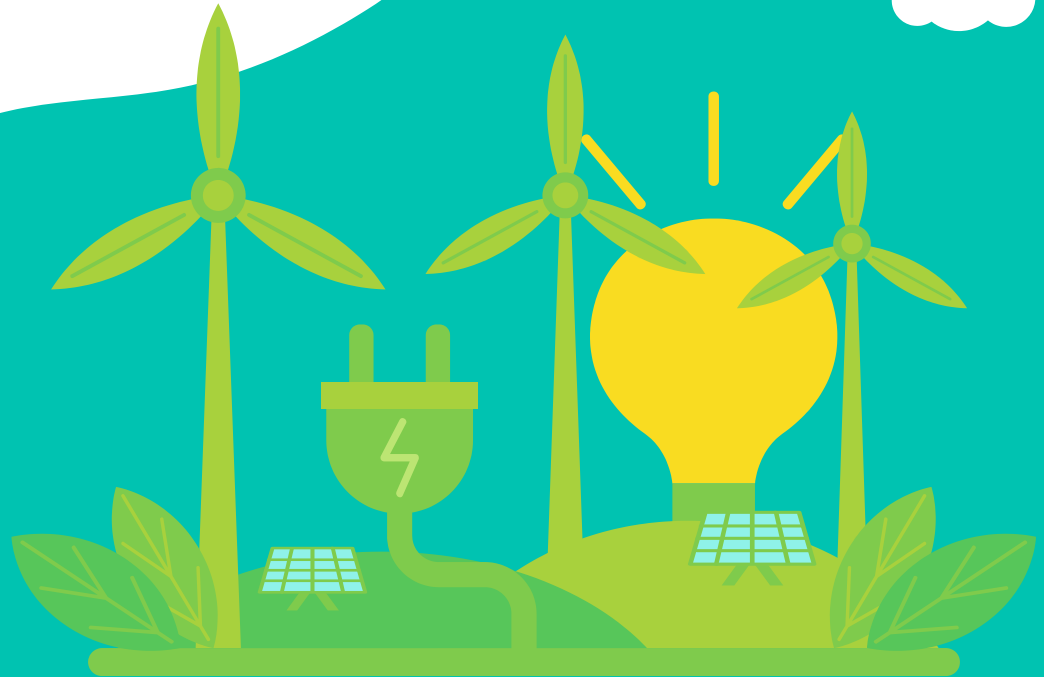


Project Day 2022

April 9, 2022

Team SolarSize

Tristan Brown-Hannibal
Karlee Fidek
Kaden Goski



Team SolarSize



Tristan

Front-End Development
Server Management



Karlee

Front-End Development
Documentation Management

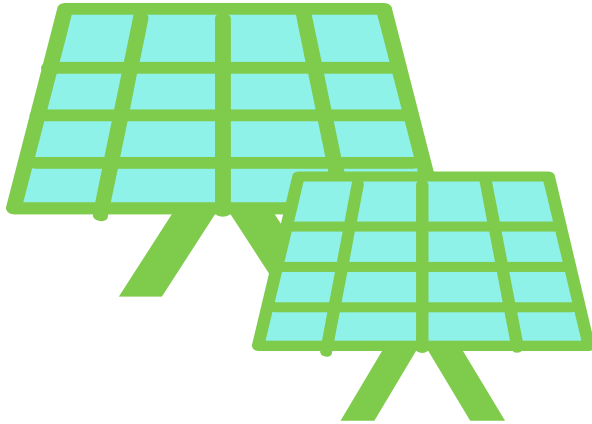


Kaden

Back-End Development
Solar Model

Project Commercial

About This Project



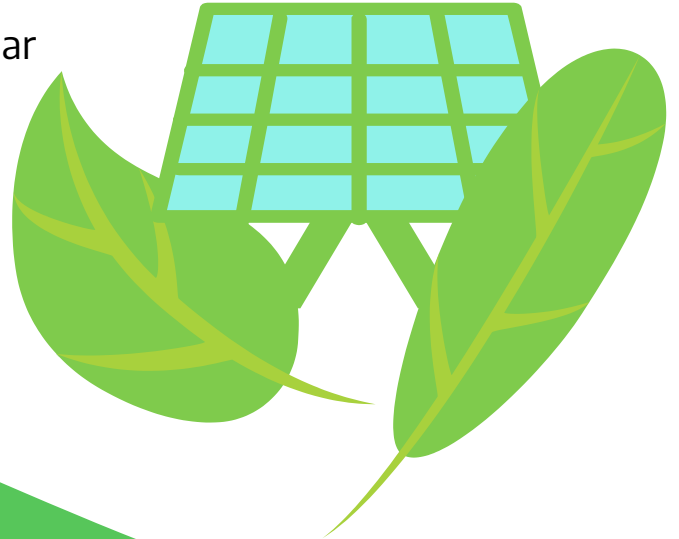
- A tool that utilizes building consumption metrics and solar intensity data to calculate accurate ROIs
- Helps to determine over/under generation windows and size solar generation solutions accordingly

The Application

- Web application
- User-friendly form which considers:
 - Location
 - Regular consumption data
 - Multiple panel types
 - Financial factors
- Built-in knowledgebase and information
- Suggests optimal solar panel setup
- Graphs
 - Regular consumption vs. solar power generation
 - Value resulting from full-credit generation vs. overgeneration
 - Annual cash flows
- Calculations
 - Total return on investment
 - Estimated kWh of solar power generated

Our Why?

- Fossil fuels are the primary source of energy in Canada
- Solar energy is renewable and sustainable
 - Alternative for fossil fuels
- Persuade more people and businesses to install solar generation solutions



The Problem



How do you choose
the best panel?



How many panels
should you use?



How much return
will you get?

Architecture



Frontend



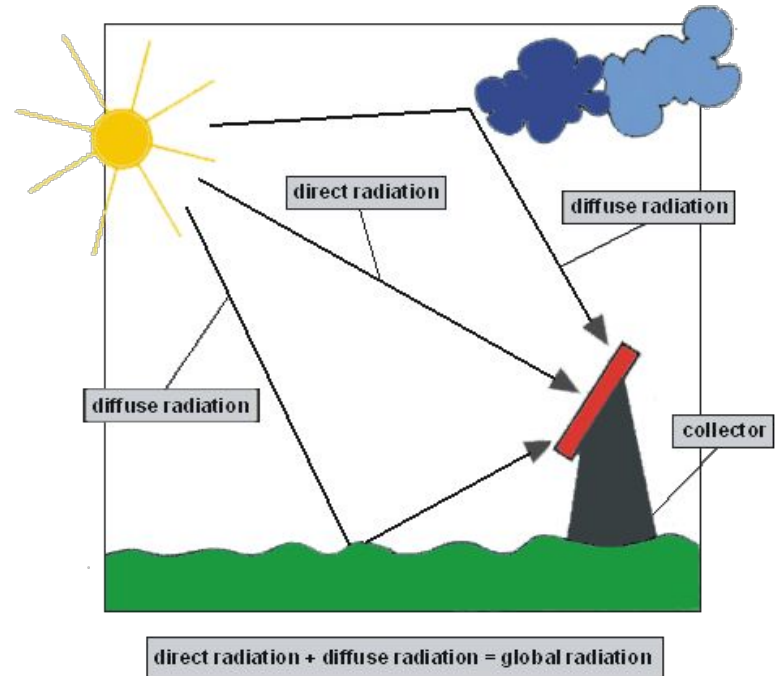
Backend



Data

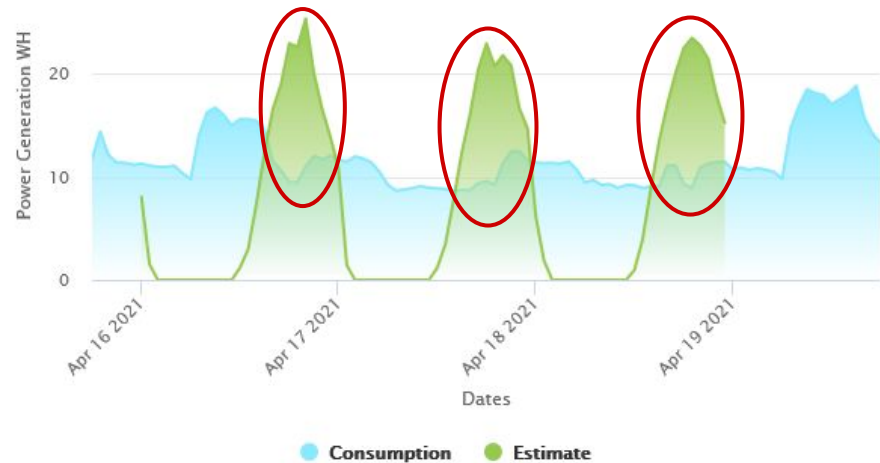
Solar Model

- Calculates estimated power output
- NASA POWER provides global solar irradiation data
- Python converts the global data to direct and diffuse components which are used in the calculations



Overgeneration

- Production of solar energy beyond consumption needs
- SaskPower only provides half-credit (7.5¢/kWh) for overgeneration
- This makes overgeneration inherently less valuable, but not valueless



Inputs



Location



Panel Options



Grants



Analysis Dates



Cost of kWh



Roof Area



Loan Rate



Consumption Data

Return on Investment

- 20 year analysis
- Calculates breakdown of solar power installation:
 - Capital Cost
 - Maintenance Cost
 - Loan Interest
 - Full-credit Value
 - Overgeneration Value
- Determines which setup provides the best financial return

Capital Cost:
\$46,927.00

Savings Earned:
\$156,921.00

ROI and Annual Cash Flow Analysis Calculations

$$\text{Capital Cost} = (\text{System KW} \cdot \frac{\text{Cost}}{\text{KW Installed}}) + \text{Interconnection Study Fee} + \text{Bidirectional Meter} - \text{Grants}$$

$$\text{Balance Remaining}(\text{end of 1st year}) = \text{Capital Cost} + \text{Loan Interest} - \text{Amount Saved}$$

$$\text{Balance Remaining}(\text{2nd year and on}) = \text{Balance Remaining} + \text{Loan Interest} - \text{Amount Saved}$$

$$\begin{aligned} \text{Amount Saved} = & (\text{Full Credit Power} \cdot \text{Value of Full Credit}) \\ & + (\text{Overgeneration Power} \cdot \text{Value of Overgeneration}) - \text{Maintenance Costs} \end{aligned}$$

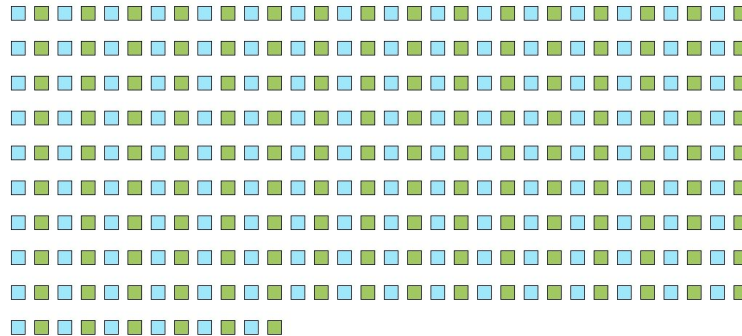
Demo Video

Optimal Solar Panel Installation

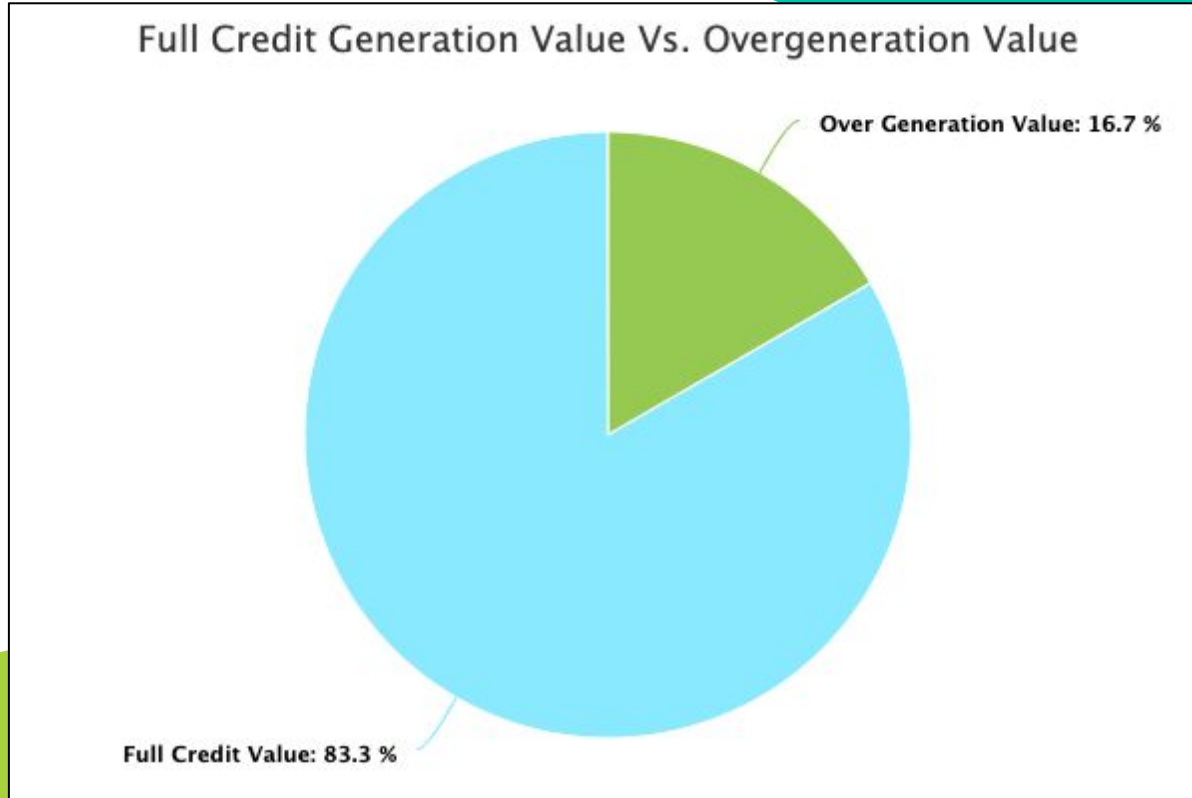
The optimal panel setup is:

237 310W Black Frame 60 cell Mono-
PERC 35mm T4 CANADIAN MADEs

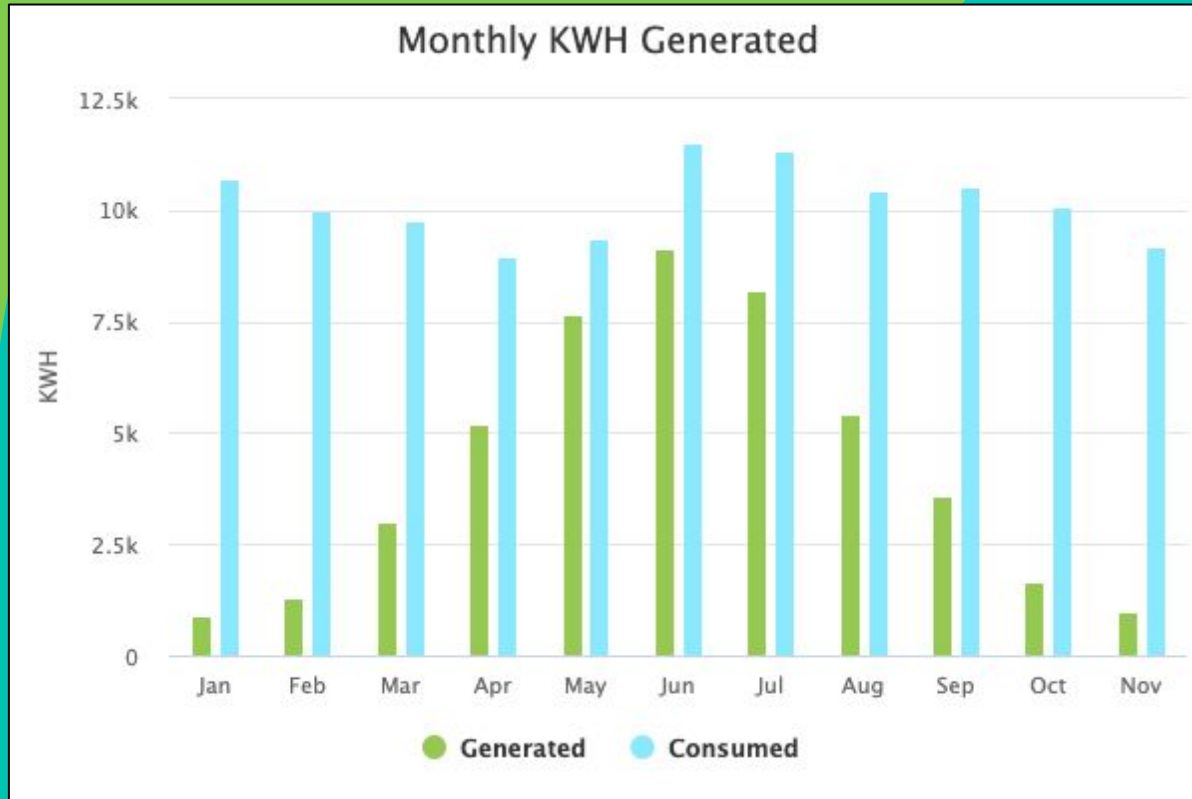
Angled at
49.6°



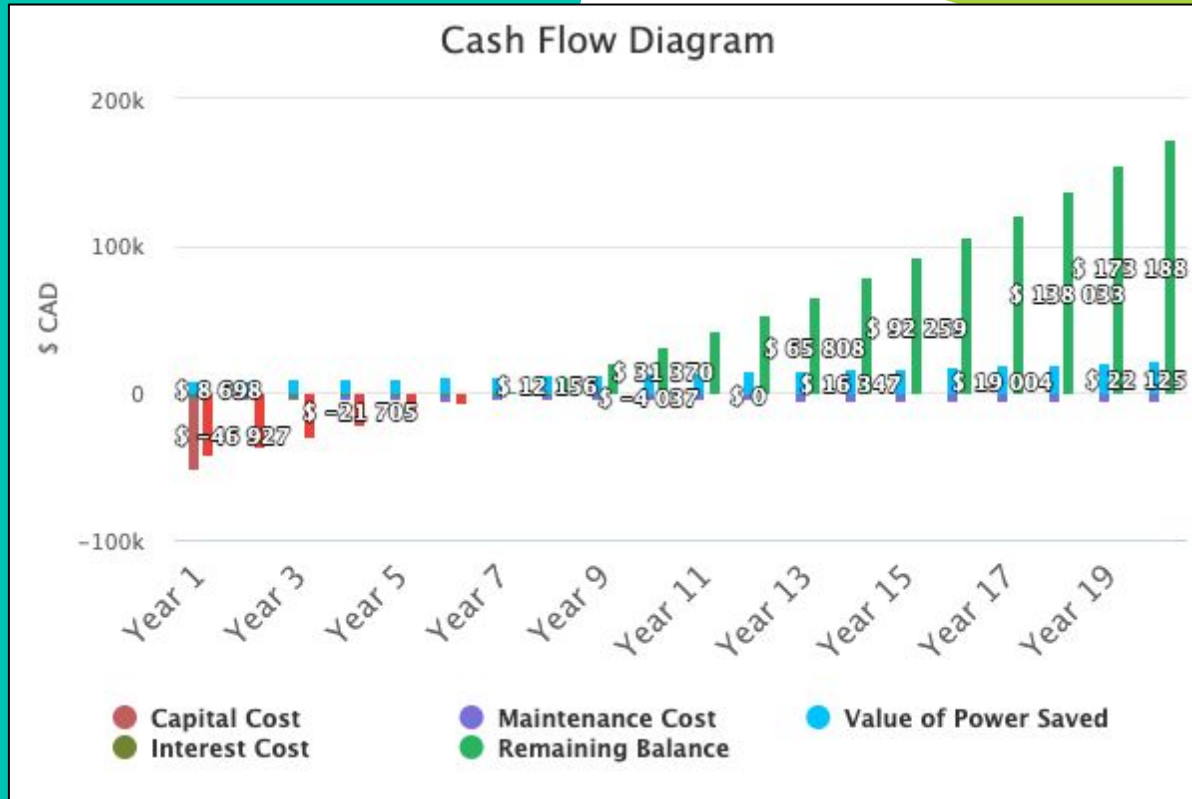
Full Credit Value Vs. Overgeneration Value



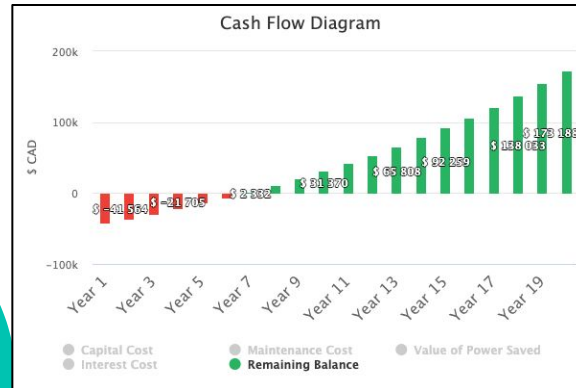
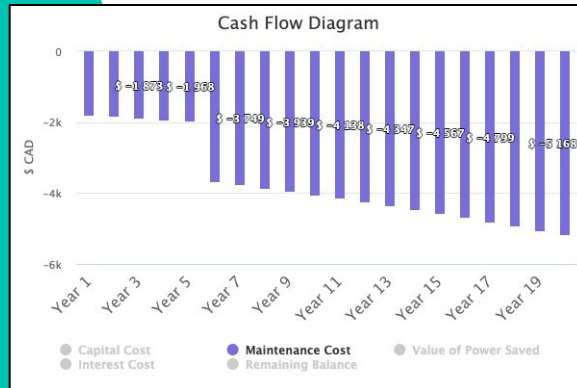
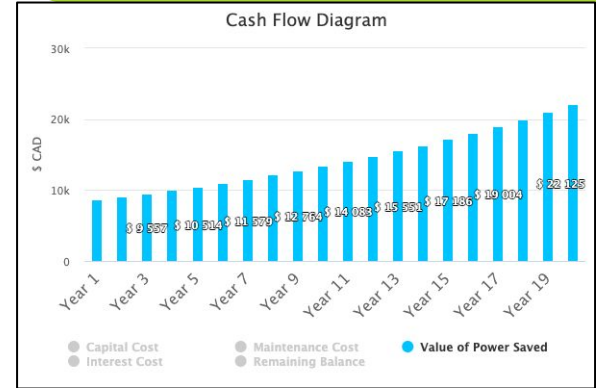
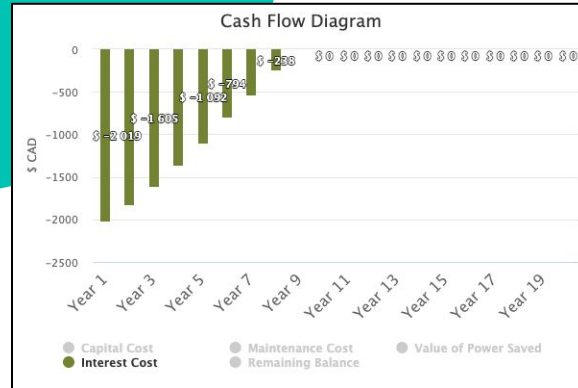
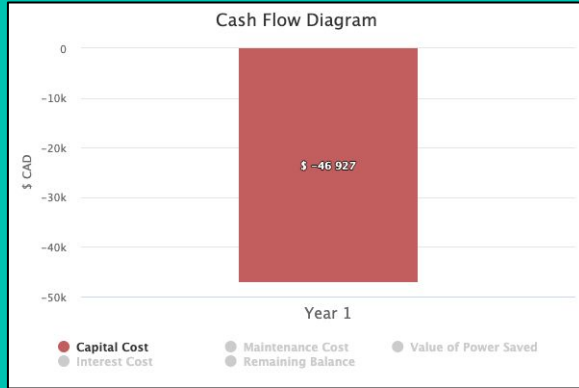
Monthly kWh Generated



Cash Flows



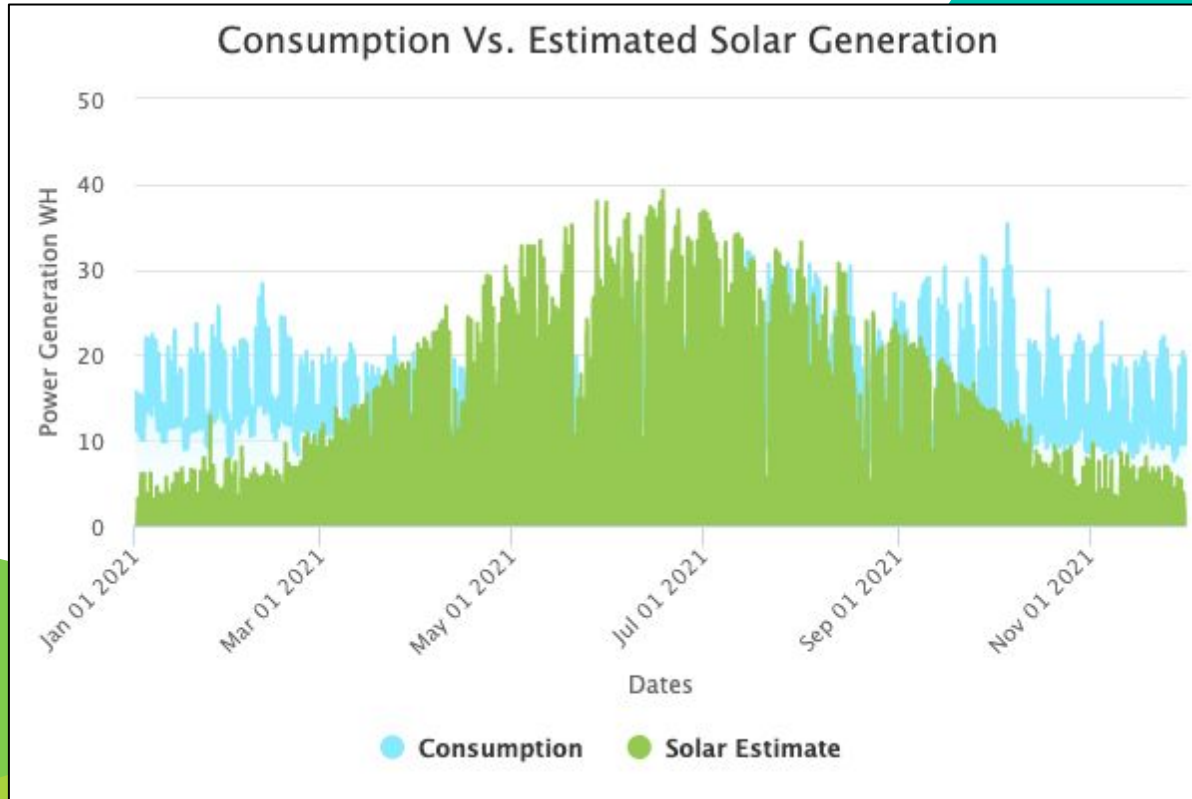
Cash Flows



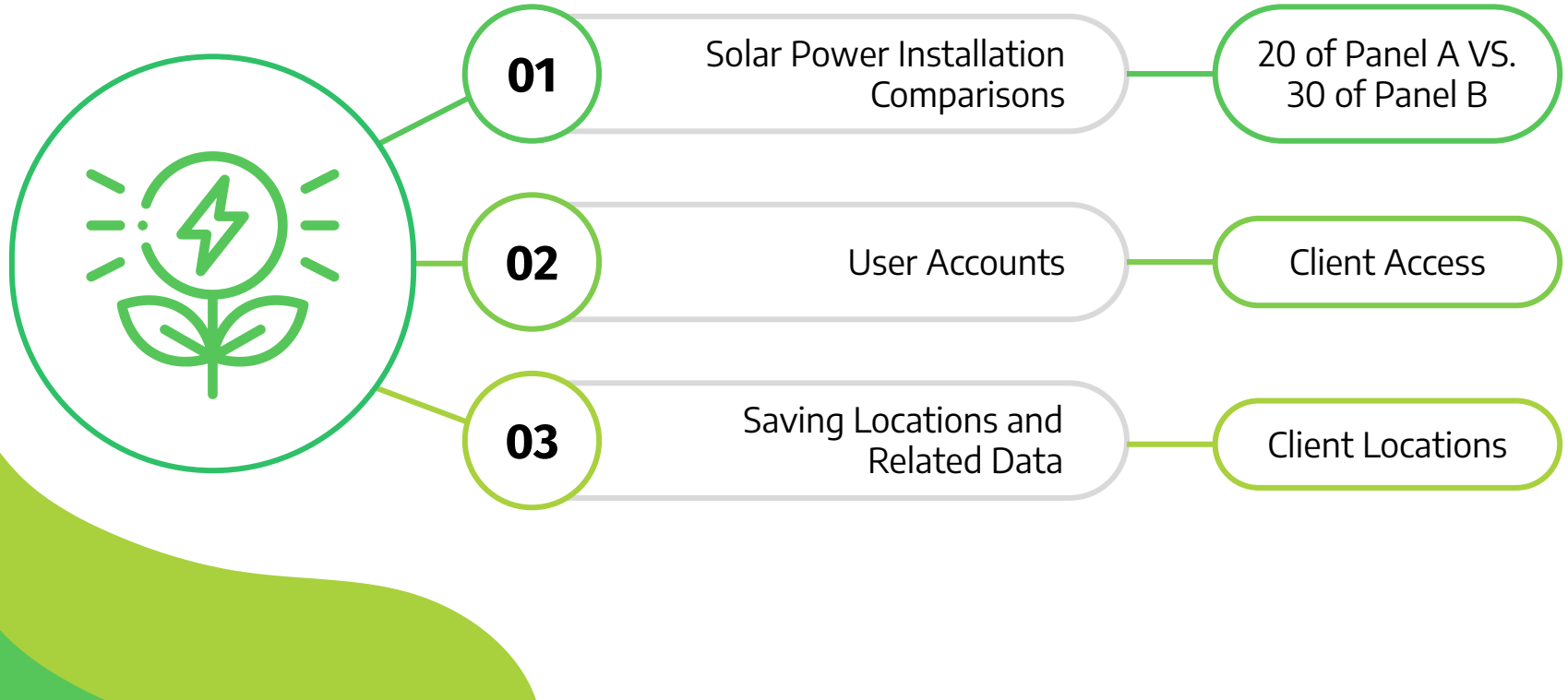
Yearly Savings/Balance



Consumption Vs. Solar Generation



Future Iterations



Acknowledgements


We would like to thank the following people for their involvement with our project.

- Project Advisor: Dr. Timothy Maciag
- Project Mentor: Dr. Kin-Choong Yow
- Project Idea: Greenwave Innovations



Questions and Comments





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