Transformer metrics

Zero Emissions Noosa

2023-08-18

Introduction

This report offers insights from transformer monitoring data. We analyze both hourly average and daily total energy transfers, and compare the energy export to a potential battery's usable capacity.

Transformer: SC1340203

Address: Doonella Bushland Reserve, Sea Eagle Drive, Noosa Shire QLD 4565, Australia

Rated Output: 315 KVA

NMI Count: 35

Connected inverter capacity: 134.2 kW

Solar density: 3.8 kW per NMI

Percent connected solar inverters to rated output: 43 %

```
## [1] "/Users/geremida/Library/CloudStorage/GoogleDrive-geremida@gmail.com/Shared drives/ZEN_data"
## [1] "Transposed filename:  NOOSA_FY2022/SC1340203_20220701_transposed.csv"
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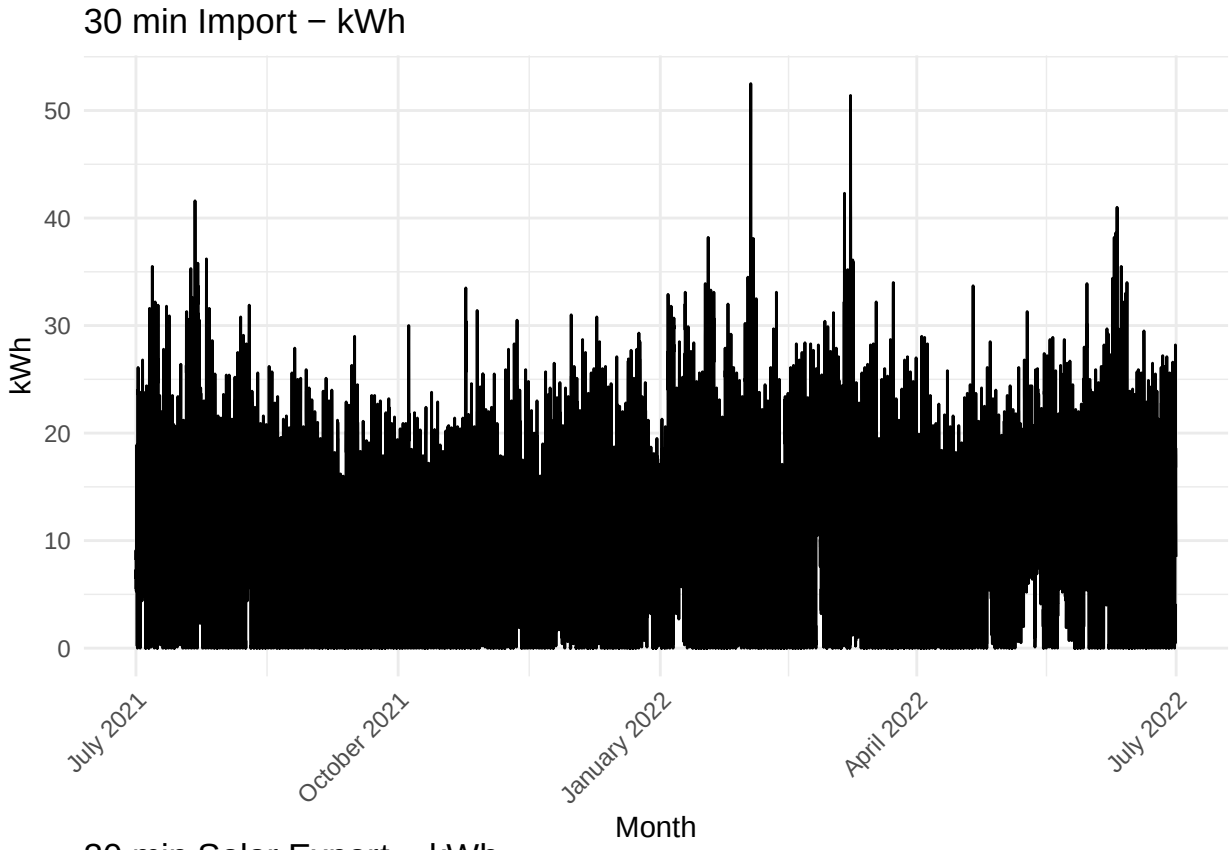
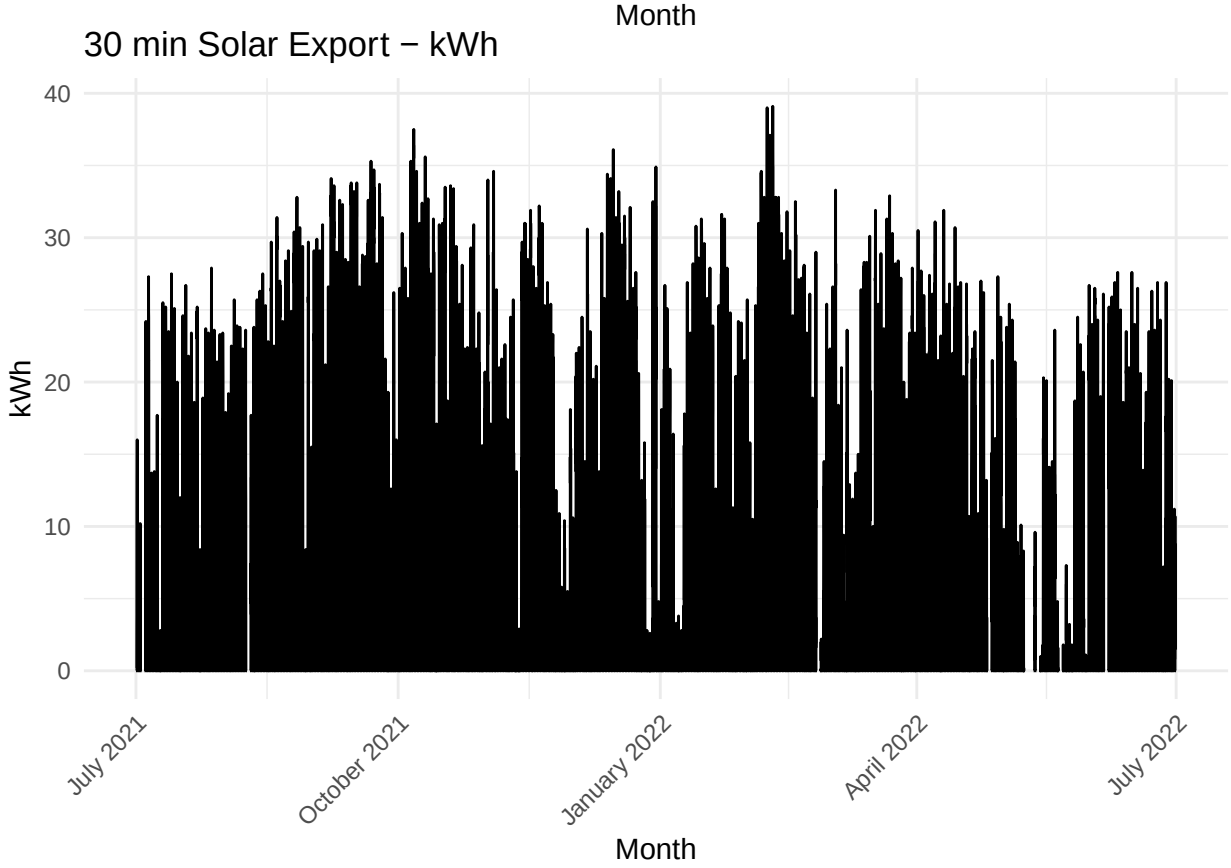
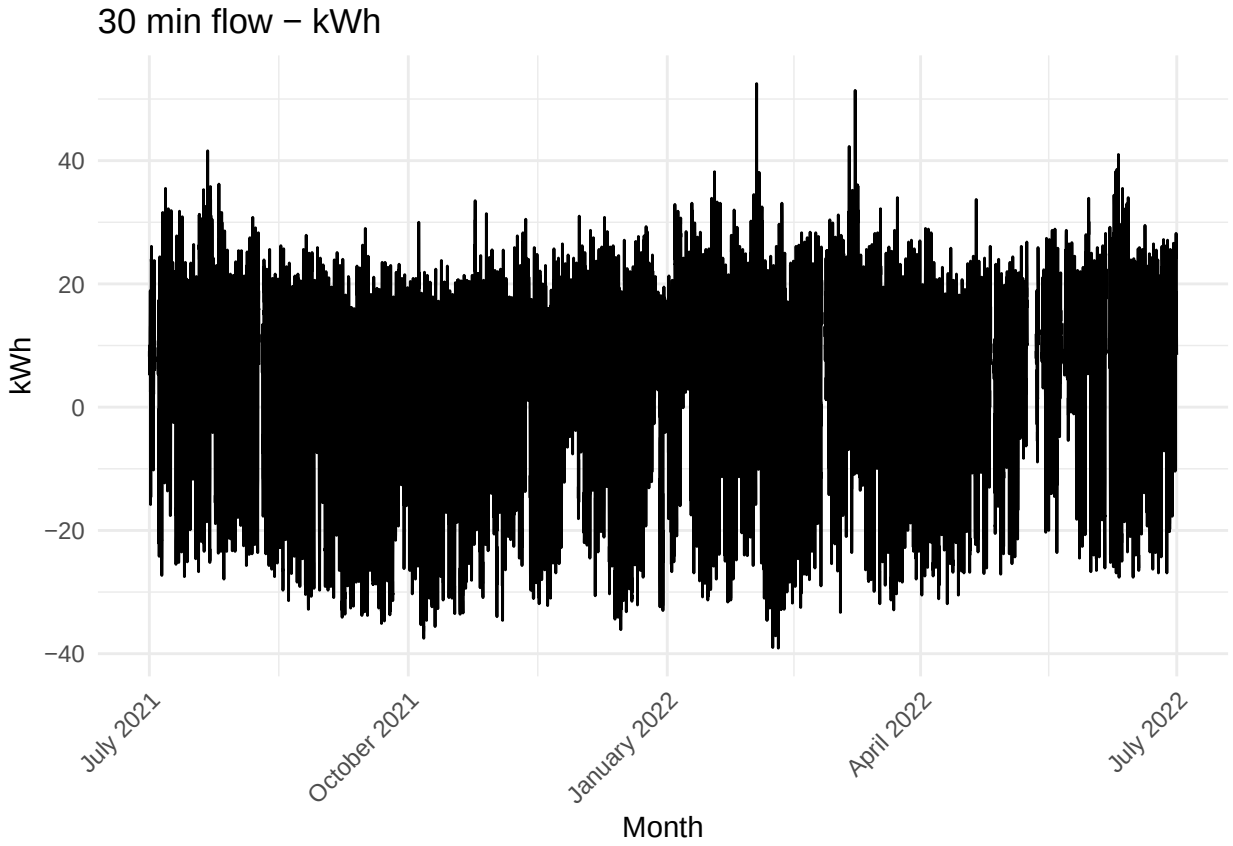

30 min Import − kWh
kWh
0
10
20
30
40
50
July 2021
October 2021
January 2022
April 2022
July 2022
Month

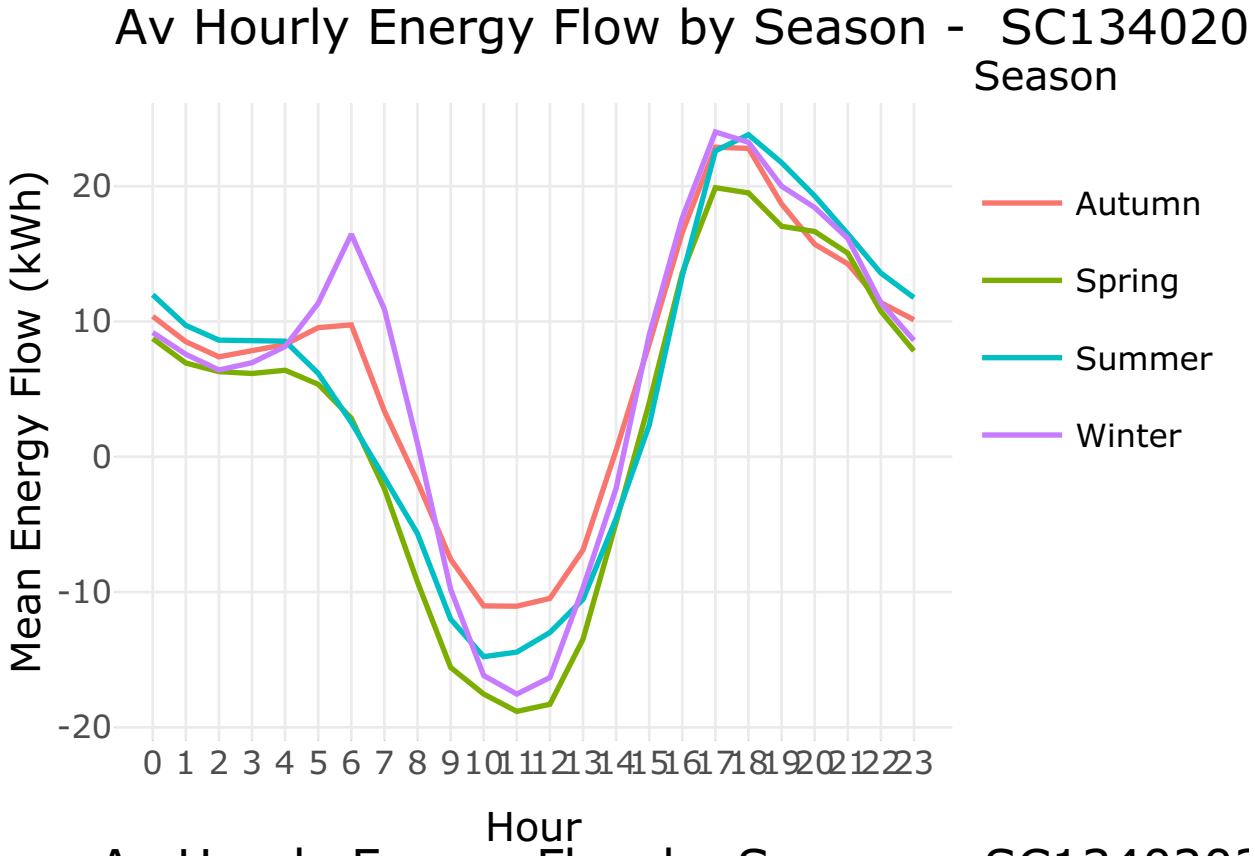

30 min Solar Export − kWh
kWh
0
10
20
30
40
July 2021
October 2021
January 2022
April 2022
July 2022
Month

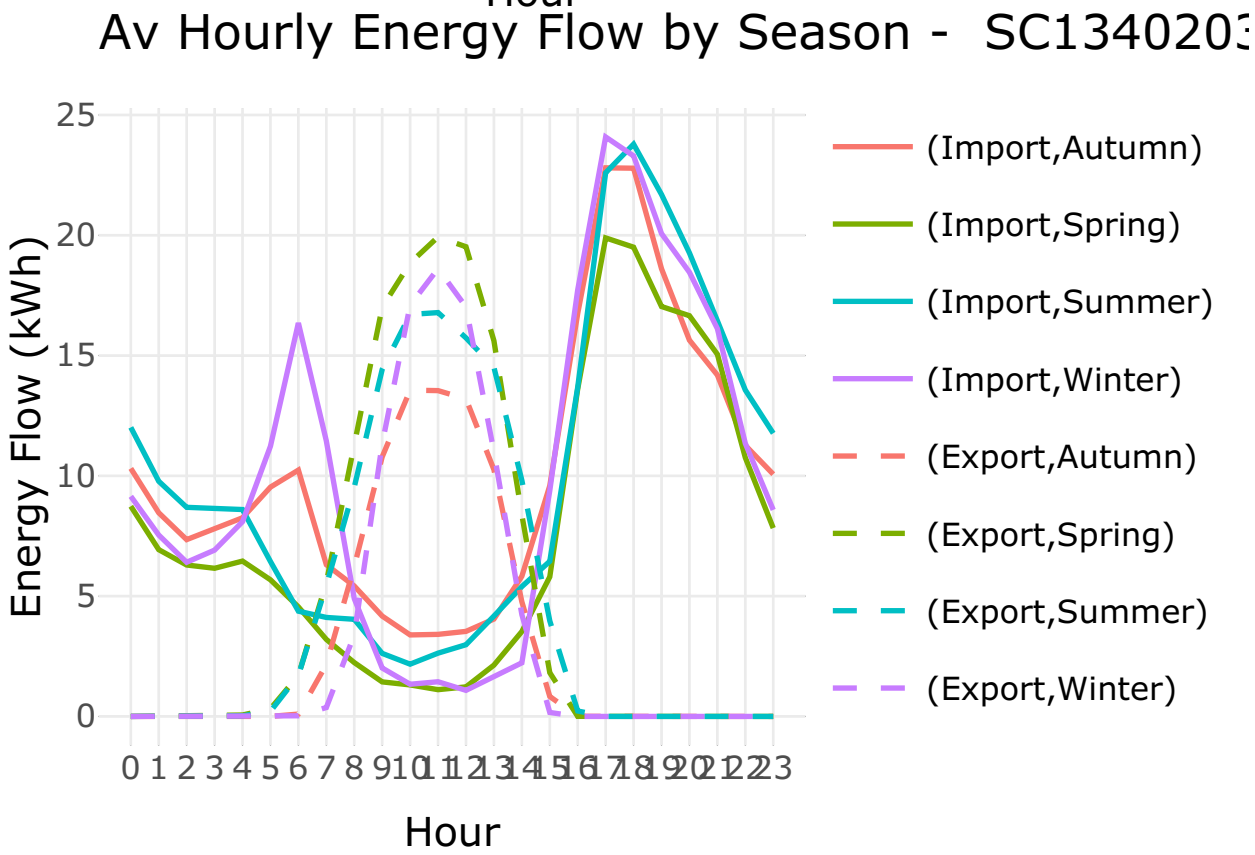


Hourly Averages

Analyze the average energy import and export for each hour of the day.

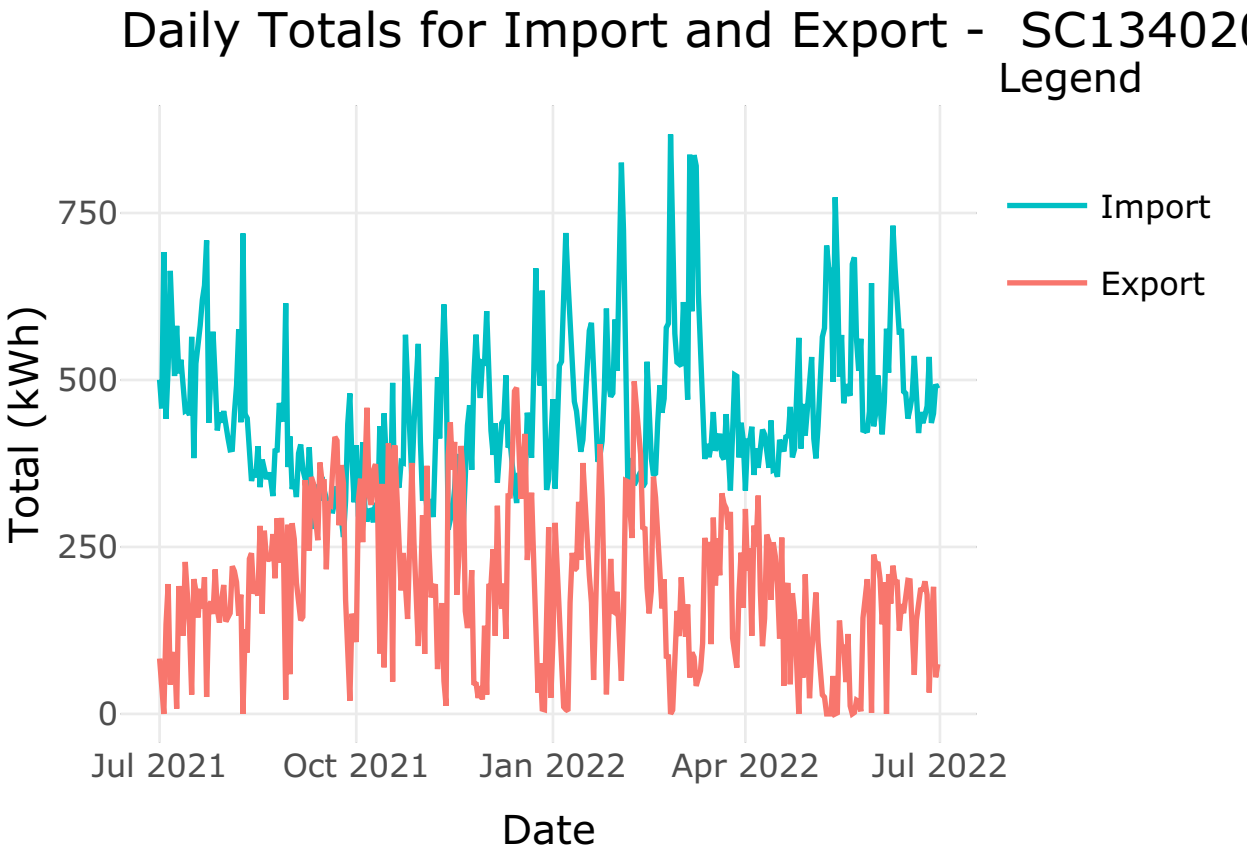
```
##
## Attaching package: 'plotly'
## The following object is masked from 'package:ggplot2':
##
##     last_plot
## The following object is masked from 'package:stats':
##
##     filter
## The following object is masked from 'package:graphics':
##
##     layout
```

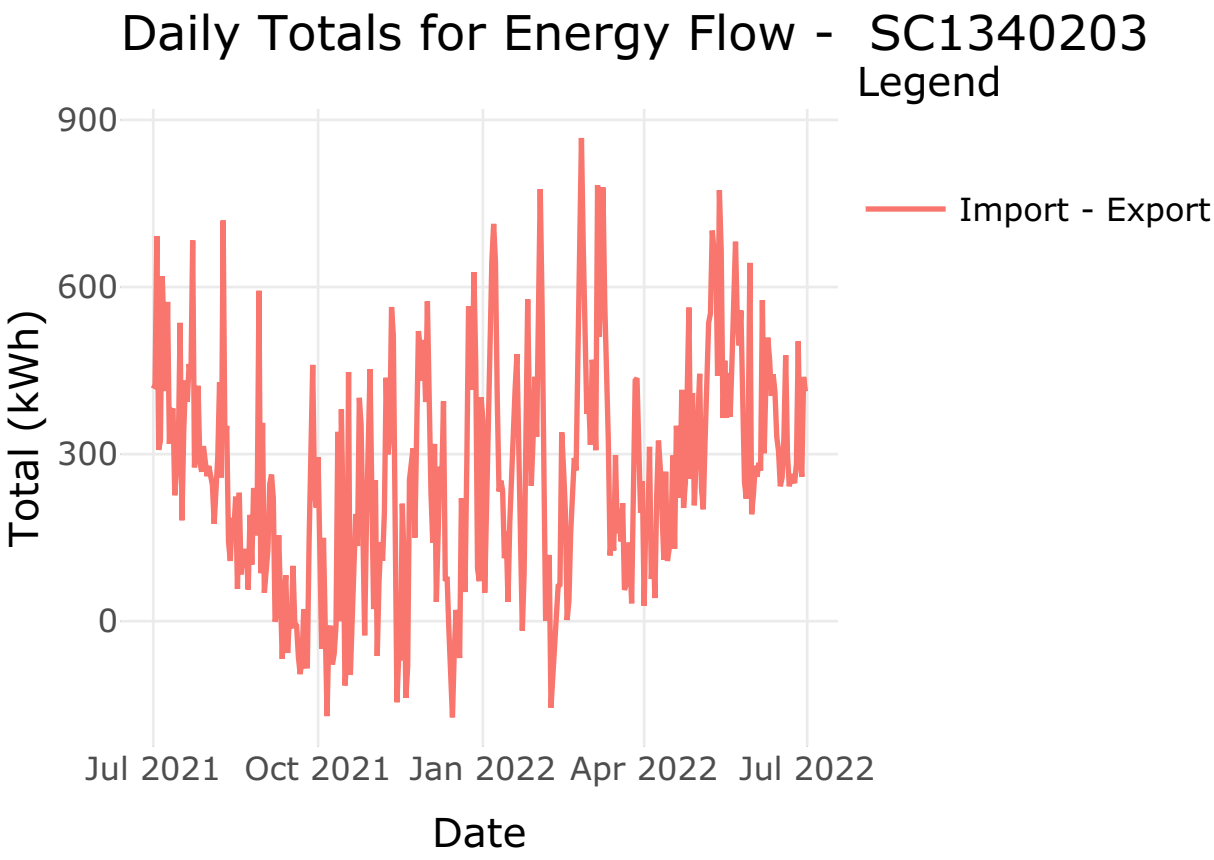

Av Hourly Energy Flow by Season - SC134020
Season
Autumn
Spring
Summer
Winter
Mean Energy Flow (kWh)
20
10
0
-10
-20
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hour


Av Hourly Energy Flow by Season - SC1340203
(Import,Autumn)
(Import,Spring)
(Import,Summer)
(Import,Winter)
(Export,Autumn)
(Export,Spring)
(Export,Summer)
(Export,Winter)
Energy Flow (kWh)
25
20
15
10
5
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hour

Daily Totals

Analyze the total energy import and export values on a daily basis.





Comparison with Battery Capacity

Gauge how the daily energy export compares with a potential battery's usable capacity.

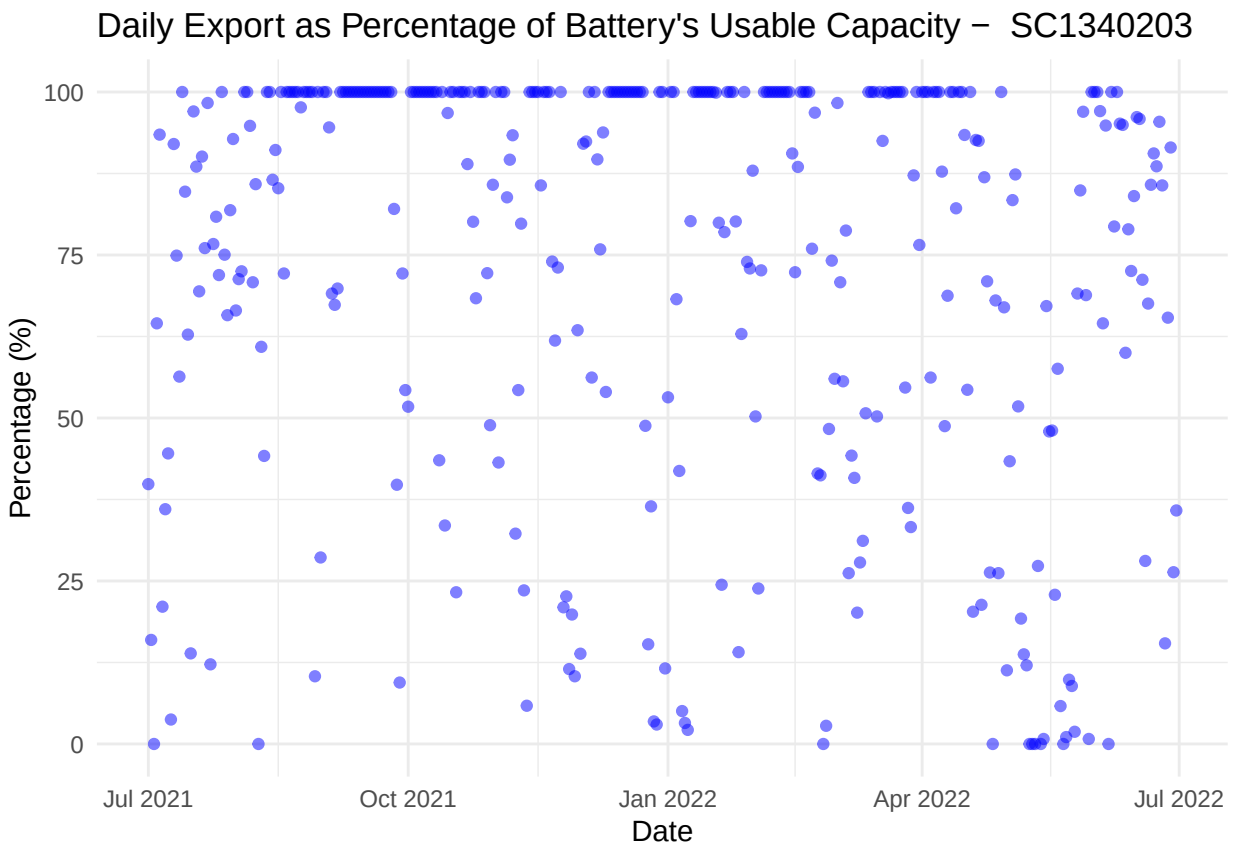
Battery Specifications

For our analysis, we'll consider a battery with the following specifications:

Total Capacity: 260 kWh

Usable Capacity Ratio: 80 %

Usable Capacity: 208 kWh



Quartile Analysis

Explore how many days fit within certain percentage quartiles of the battery's usable capacity.

Table 1: Days Distribution Across Export Percentage Quartiles

quartile	n	percentage
0 to <25	53	14.5
25 to <50	34	9.3
50 to <75	60	16.4
75 to <100	76	20.8
100+	142	38.9

Total number of days of metered data = 365

Total Solar Export, Import, Estimated Generation and Self Consumption

Assume 1kW inverter produces 1.3 MWh per year

Table 2: Totals for Solar Export, Import, Solar Generation, Self Consumption

Category	Total_MWh
Solar Export(reverse flow)	69.1
Import from grid	165.0
Estimated Solar Generation	174.5
Estimated Self Consumption	105.4
Estimated Battery Charging	75.9
Av daily Export per NMI(kWh)	5.4
Av daily Import per NMI(kWh)	12.9

Maximums and Minimums

Table 3: Minimum, Maximum and Mean values

Columns	Minimum	Maximum	Mean
Import kWh	0.1	52.5	9.4
Export kWh	0.1	39.1	4.0
Current 1	4.7	126.2	30.3
Current 2	7.0	186.4	33.5
Current 3	11.2	250.6	60.7
Import kvarh	100.0	4600.0	362.5
Export kvarh	100.0	5800.0	2900.8
Total Harmonic Distortion 1	1.1	3.1	2.1
Total Harmonic Distortion 2	1.2	3.1	2.0
Total Harmonic Distortion 3	1.3	3.3	2.3
Voltage 1	229.5	248.3	242.0
Voltage 2	229.7	251.4	244.3
Voltage 3	231.5	249.0	242.9
Current Phase Angle 1	-173.8	8.1	-43.3
Current Phase Angle 2	-173.8	8.1	-43.3
Current Phase Angle 3	-179.0	179.1	-4.9