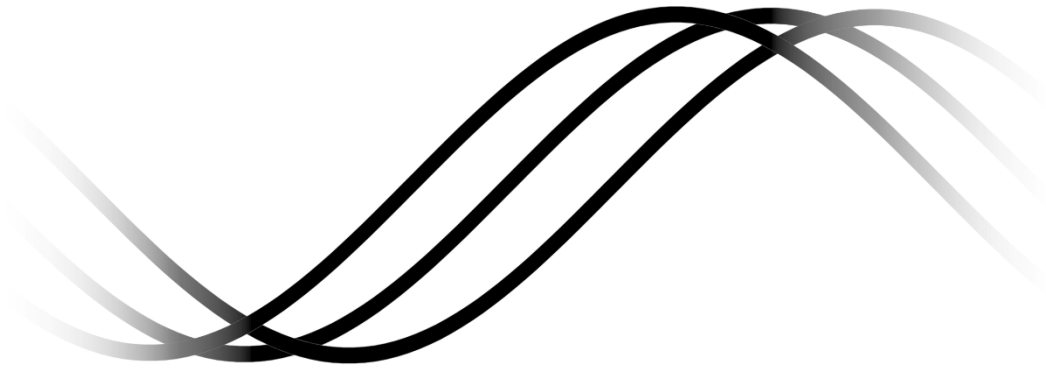




*phisaver*

# Electrical Monitoring Overview

## **Summary**

*Details of the PhiSaver energy monitoring system including typical installations, technical specifications, and software details.*



## Document Information

|                      |                                                                          |
|----------------------|--------------------------------------------------------------------------|
| <b>Title</b>         | Electrical Monitoring Overview                                           |
| <b>Revision</b>      | D                                                                        |
| <b>Revision Date</b> | 20 February 2024                                                         |
| <b>Prepared By</b>   | Brett Beeson<br>PhiSaver Pty Ltd<br>ACN 673 361 263                      |
| <b>Contact</b>       | +61 423 385 624<br>phisaver.com<br>39a Aberleigh Rd<br>Herston, QLD 4006 |

## Revision Information

| <b>Revision</b> | <b>Date</b> | <b>Description</b> |
|-----------------|-------------|--------------------|
| A               | 17 Jan 2021 | Initial Issue      |
| B               | 21 May 2023 | Update             |
| C               | 20 Jan 2024 | Update             |
| D               | 20 Feb 2024 | Update             |

## Prepared By

Brett Beeson, a professional building services engineer with 20 years of experience.

Brett's qualifications include RPEQ, CMVP, Bachelor of Engineering (Hons), Bachelor of Computer Science.



## 1 What does PhiSaver do?

The Phisaver energy monitor pinpoints energy saving opportunities.

Instead of a bill with a *single* number, *after* you've used that energy, you get real-time, broken-down energy usage.

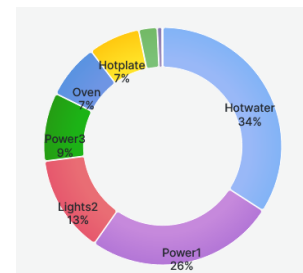
Specifically, it continuously monitors every circuit in a switchboard and records the data for analysis.

## 2 A Real World, Small Scale Example

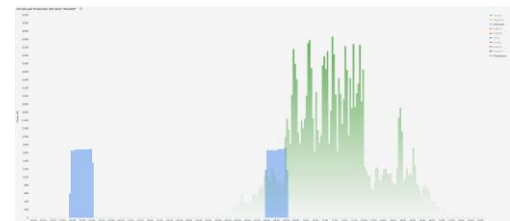
This small site had \$1500/month electricity bills.

Clients guessed it was lights. They retrofitted lights with no improvement.

Phisaver analysis showed the main **culprit was hotwater**.



Further analysis showed the hot water (in blue) was **on at night** when no solar electricity (green) was available.



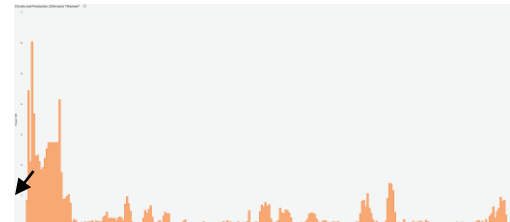
24 hours

A \$100 timer was installed to force hotwater to heat and store during the day. Timed hotwater (orange) is now **running on solar, mostly for free**.



24 hours

**Now looking at 6 months data**, after the improvement (arrow) hotwater (orange) consumption is close to zero, except for some cloudy days.



6 months



### 3 How does it work?

The system comprises four components. Users only “see” the final component.



1

*Inside the switchboard, each circuit has a current transformer sensor. We see three black blocks here.*



2

*A micro-computer reads the sensors, reports the current, power factor and voltage readings at 10 second intervals, taking thousands of samples per second.*



3

*In the cloud, a specialised database records the information and summarises it  
Data is also stored locally.*



4

*Users can see energy use from anywhere, on any device. Both real-time and historic data is available. Self-serve via a dashboard, and/or receive periodic summaries and alerts.*



## 4 Specifications

### Readings available

Voltage (V)

Current (A)

Energy (kWh)

Power Factor (phi)

### Reporting Time

10s intervals

### Resilience

Data is recorded locally (5 years).

Data is continuously sent to the database when the network is available.

Automatic restart on power loss.

### Power Supply

Hardwired, included. Typically, a circuit is used to supply a GPO (powerpoint).

### Circuits

Any number

### Single or Three Phase

Both can be monitored

### Enclosure

Weatherproof, tamperproof

### Current Transformers

Echun or AccuRate

Double insulated

20A to 1000A available

### Interfaces

Website and mobile view of graphs from anywhere with sophisticated analytics.

Restful API for third-party integration.

Embedded, live panels for integration.

Live unattended 'kiosk' mode.

### Options

Custom (e.g. busbar) CT on demand

Steel, lockable for exposed sites

Custom dashboards

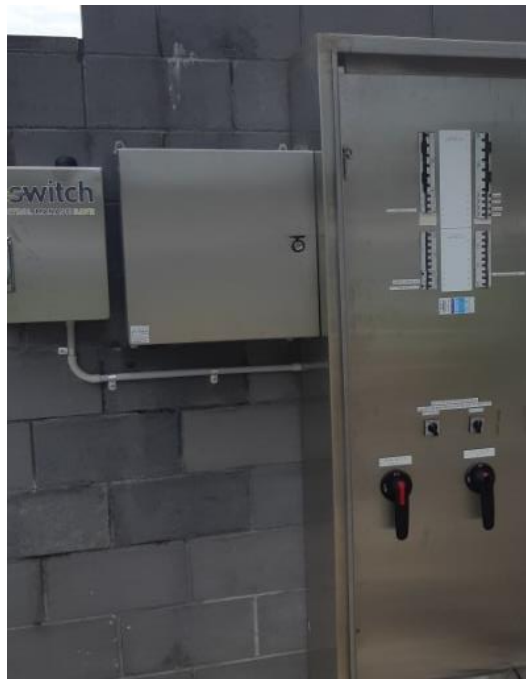


## 5 Installation

The hardware is provided in a weatherproof enclosure next to the switchboard. All types of constructions and switchboards can be accommodated provided sufficient space is available. Some typical installs are shown below:



*Figure 1 – External Lockable Switchboard Installation*



*Figure 2 – External lockable installation with stainless steel option. 4G puck antenna on right.*



## 6 Interface

A responsive website displays the data. Users have a secure, one-click login.

From example see below or check out a [live site](#).

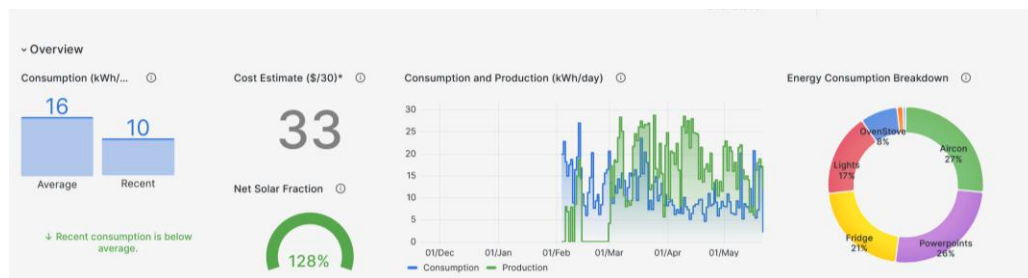


Figure 3 - Small residential with simple overview

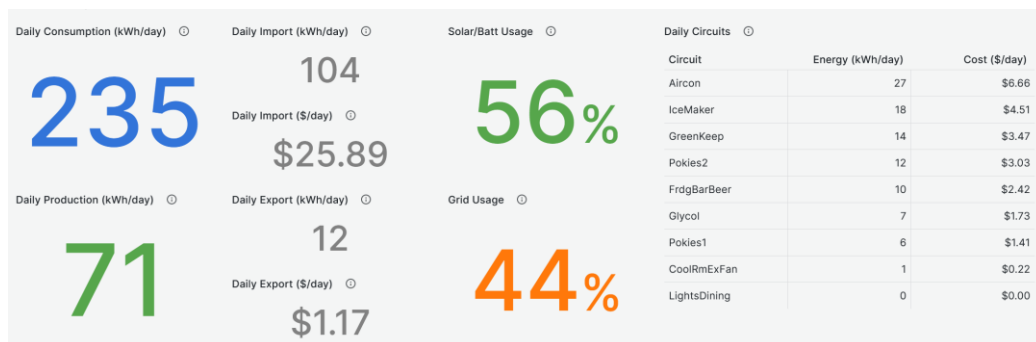


Figure 4 – Medium size sports club with sport - \$/day for quick understanding of 'easy wins'

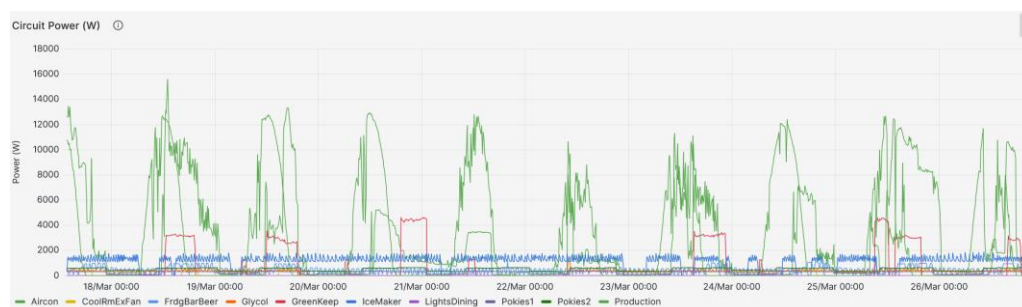


Figure 5 – Detailed analysis – this is one week – for full understanding of the site



## 7 Mobile and Alerts

PhiSaver can send stakeholders email, PDF reports, SMSs and the like. They are automatically generated and can be delivered regularly or on an event, such as “oh no, your solar is down”. Some examples are below:

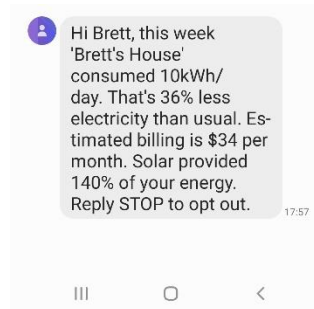


Figure 6 - Brief weekly SMS

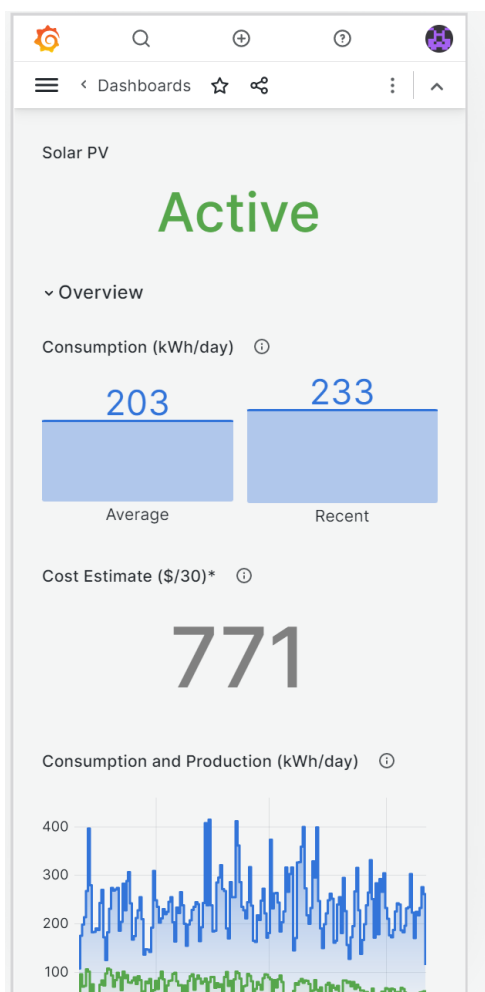


Figure 7 – Mobile View

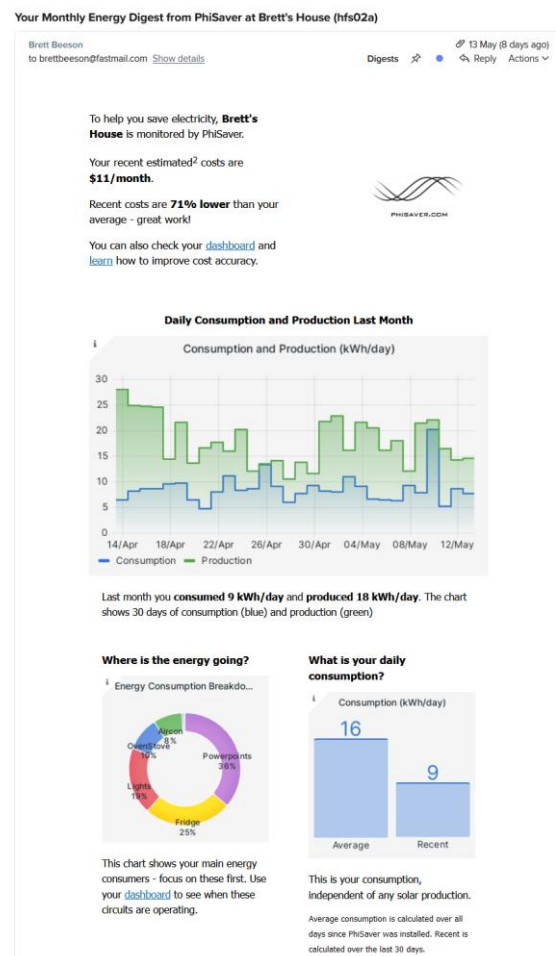


Figure 8 – Emailed Reports



## 8 Multi-Site Aggregation

Multiple sites can be aggregated, and custom visualizations can be provided.

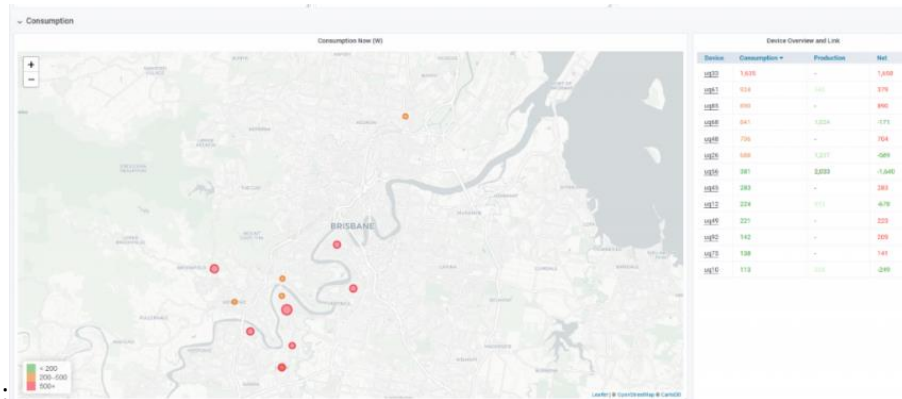


Figure 9 – Sites overview with display on a dynamic map

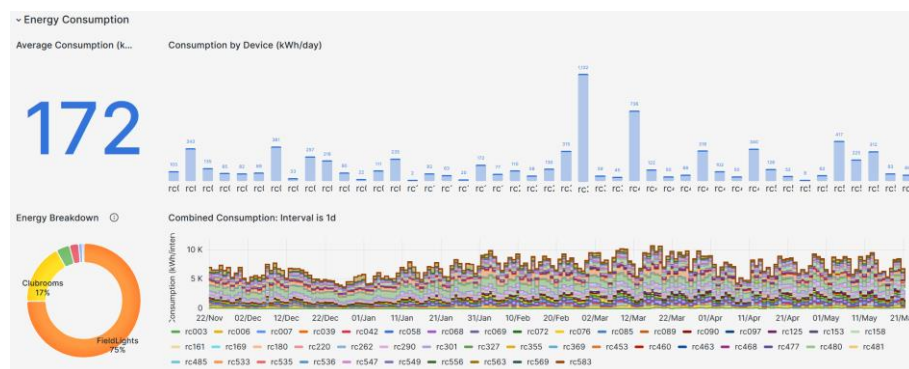


Figure 10 – Multi-site consumption – here it's all about "Field Lights", then "Clubrooms".

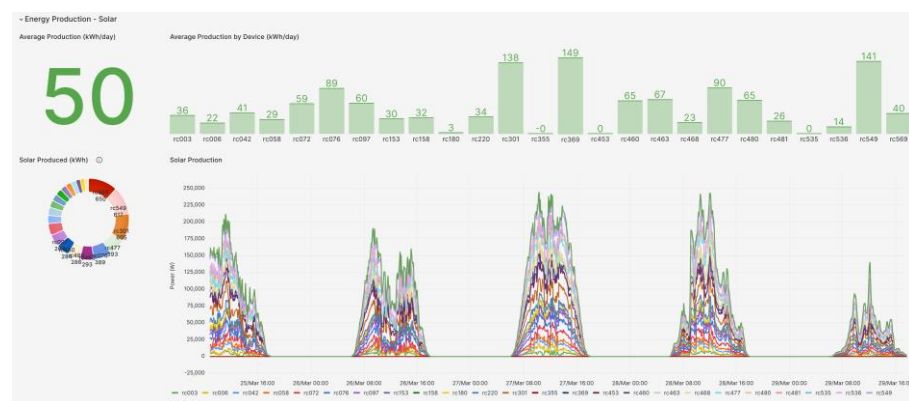


Figure 11 - Multi-site solar – three days ... it's getting cloudy.



## 9 Frequently Asked Questions

### Is there a subscription cost?

PhiSaver come with one-year free analytics.

A typical subscription after that is \$95/month, which various options.

Without analytics subscription, the monitor still works. The energy data is stored locally on the device and is accessible, but without analysis, alerts, charts, etc.

### Can I see individual appliances on the *same* circuit?

No, not directly. Monitoring is on a *per circuit* base. So, for example, if your chiller and fans are on the same circuit you'll see the total circuit power, not the individual units. In practice, most large appliances, such as air-conditioners, are on separate circuits. Appliances such as fridges have a characteristic signature, and their power can be usually deduced from the total.

### Can solar be seen?

Yes, solar can be added as a circuit and totals like "grid / solar consumed" are provided.

### Can I show it off display to customers?

Yes, there is an unattended dynamic slideshow available. Just point a computer to a (secret) URL and display it on a wall screen / billboard / tablet. Here is a tablet view:

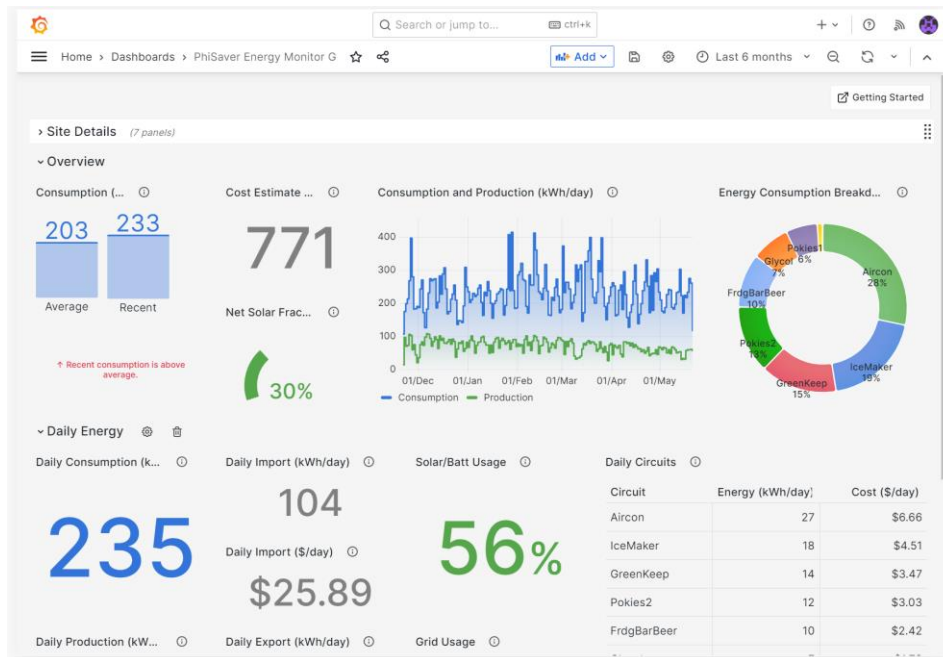


Figure 12 – Unattended view on a wall-mounted tablet



## 10 Software, Licences and Data Details

|                           |                                    |
|---------------------------|------------------------------------|
| <b>Computing Hosting</b>  | Amazon Web Services                |
| <b>Backup</b>             | Redundant storage and daily backup |
| <b>Software Licencing</b> | Open Source                        |
| <b>PI/PL</b>              | \$10 million                       |
| <b>Warranty</b>           | 3 year parts and labour            |
| <b>Electrical Licence</b> | Beasy #73108 #113699               |

## 11 Installation Requirements

|                                |                                                                                                                                                                      |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Time and Power Shutdown</b> | Install takes a few hours, with power off for two hours.<br><br>Live works can be undertaken only where no other feasible options are available – please contact us. |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 12 Hardware Details

PhiSaver tries to use standard components where possible to improve reliability. There are some specialist components.

**Sensors** (“CTs”) come from two suppliers (for redundancy):

- Accu (Canadian): [datasheet with compliance and technical details](#)
- Echun (Chinese): [datasheet with compliance and technical details](#)

**Controller** is a genuine [IotaWatt](#) based on the ESP8266 chip, made in USA (CE,FCC)

**The power** supply is a standard GPO with USB (Australian Standard Certified SAA).

**Voltage reference** from 9V transformer (MEPS approved).

**Enclosures** are 1.6mm sheet metal, earthed (IP66), or polycarbonate. Typically 400x300x200.