

Chorus PV display

USER MANUAL



Contents

Welcome	3
Safety	3
What's in the box?	4
Setting up	5
Display overview	9
Using your display	10
<ul style="list-style-type: none">• Electricity app• Income app<ul style="list-style-type: none">◦ <i>Time periods</i>◦ <i>Calculate your income:</i><ul style="list-style-type: none">◦ <i>Feed-in tariff (FiT) / generation tariff</i>◦ <i>Deeming / export tariff</i>◦ <i>PV array size</i>◦ <i>Calculate your savings</i>• Cost app<ul style="list-style-type: none">◦ <i>Setting a budget</i>◦ <i>Making savings</i>• Environment app	
Making the most of your electricity	16
<ul style="list-style-type: none">• Generation vs. Import• Top tips	
Energynote online service	18
Optional extras	19
Pairing	20
FAQs	21
Technical specifications	22
Notes	23

Welcome

Welcome to **geo's Chorus PV**, our advanced energy management service for homes with PV (solar) arrays.

The Chorus allows you to take control of your energy by monitoring home use and solar generation at the same time. The Chorus learns your normal usage patterns for each day of the week, so the display can tell you when to use electricity at the most efficient times – meaning you can reduce your bills and save money.

Knowing your energy patterns will help you set realistic budgets appropriate to you, your home and the time of day or year. The Chorus provides at-a-glance information on whether you are above or below your budget so you can keep track 24/7. Simple graphics show usage, cost and carbon. You can check just how environmentally friendly you are being (the more environmentally friendly, the greater the savings).

With **geo's web pack**, you can access all this data from your Chorus display or online on our **energynote** website. Here you can set up your own personalised account with more in-depth information, hints and tips and further analysis. You can look at your energy use in as much detail as you would like to see.

Safety



When fitting the sensors, if the cables coming out of the meter look perished (cracked, burned, or bare copper) or are loose, or wet, or you have any doubts about their condition, do not install the sensor, contact a qualified electrician. Don't force the CT sensor on the mains cable if the cable diameter appears to be too big.



Keep the display away from water.



Clean with a soft, dry cloth.



If any of the components appear damaged, contact us.



This is a user installable display. There is no need for you to connect or disconnect any cabling.



If you need to replace the batteries you must only use NiMH rechargeable ones. Non-rechargeable ones must not be used.



To protect the environment, please take your batteries to a recycling centre for safe disposal.



For use in a dry, indoor environment only.

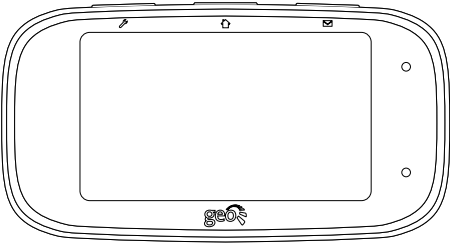


Please only use the power supply provided.

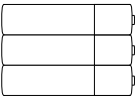


This product is RoHS compliant and CE approved.

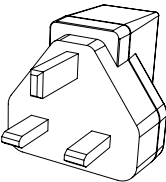
What's in the box?



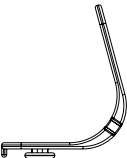
Chorus PV



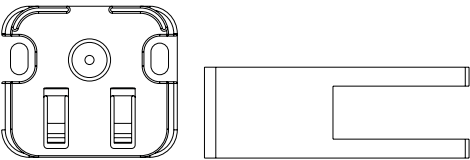
3 x AAA rechargeable batteries



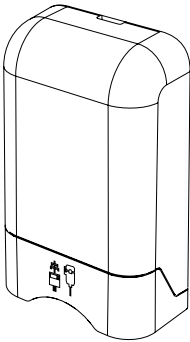
Power supply



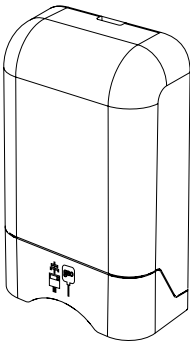
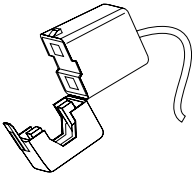
Desk stand



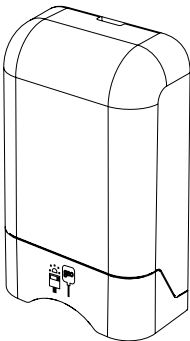
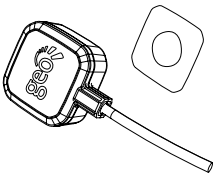
Wall mounting bracket and removal tool



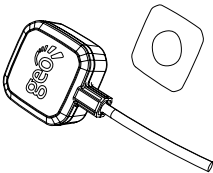
Import meter transmitter and CT cable clip (🔌) for the electricity meter.



Import meter transmitter, LED sensor (🔌) and Velcro ring for the electricity meter.



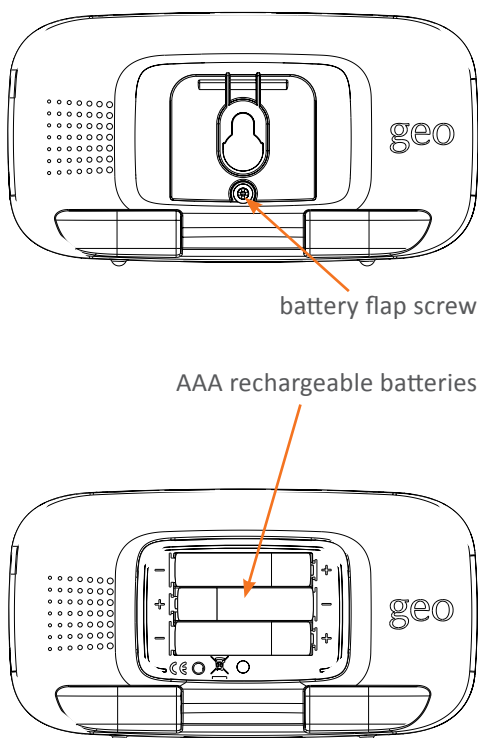
Microgeneration meter transmitter, LED sensor (🔌) and Velcro ring for the generation meter.



Setting up

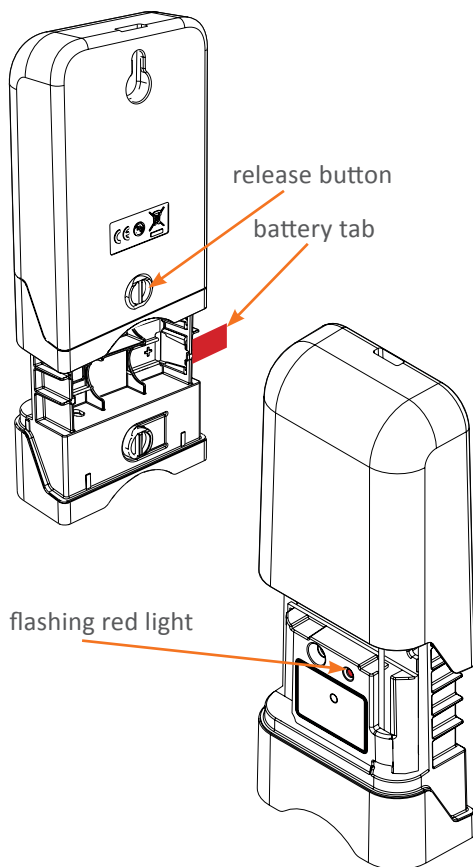
Step 1 - Power up

Unscrew the battery flap and insert the batteries supplied. Replace the cover and plug in the power supply. The display takes around two minutes to start. Please note: the batteries are for backup only. If you need to replace the batteries you must only use NiMH rechargeable ones.



Open each of the three transmitters by pressing the button on the back and pulling the outer cover away.

Remove the red battery tab. The flashing red light will show that the unit is working.



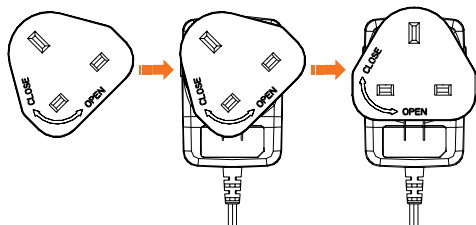
When you have connected your display to the internet it will set up the time and date automatically. If you want to do this manually it's in the menu:

✂ » **Settings » Time and date.**

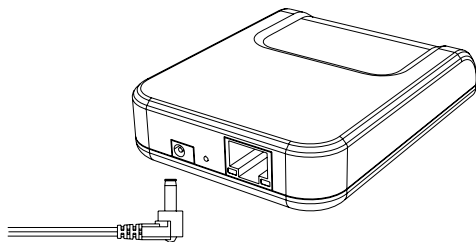
Step 2 - Connect to the internet

In order to connect your display to the internet you must pair your Chorus display to the internet bridge, contained in the optional **web pack**.

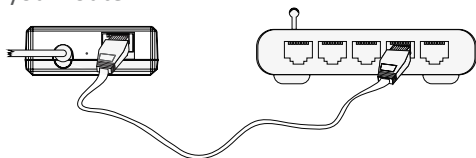
Remove the power supply then select the correct set of pins for the UK. Insert and twist clockwise to clip the pins to the power supply.



Insert the power cable into the internet bridge and then plug it into the wall **but do not turn it on yet**, your Chorus display will tell you when to turn it on.

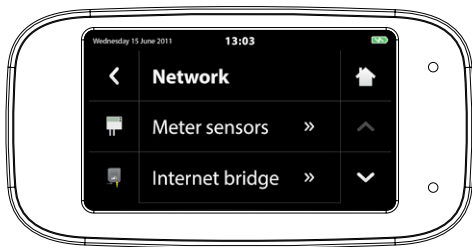


Plug the Ethernet cable into the back of your internet bridge and plug the other end into your router.



Pair the internet bridge to the Chorus by selecting **» Installation » Network**

Tap the internet bridge option and follow the instructions on screen to pair your Chorus to the internet bridge.



Step 3 - Installation status

Check the connectivity of the sensors by selecting **» Installation » Status**






A green light shows that a sensor is working; if a red or amber light is showing please see the FAQs section.

Check the status of the internet bridge by scrolling down the page.

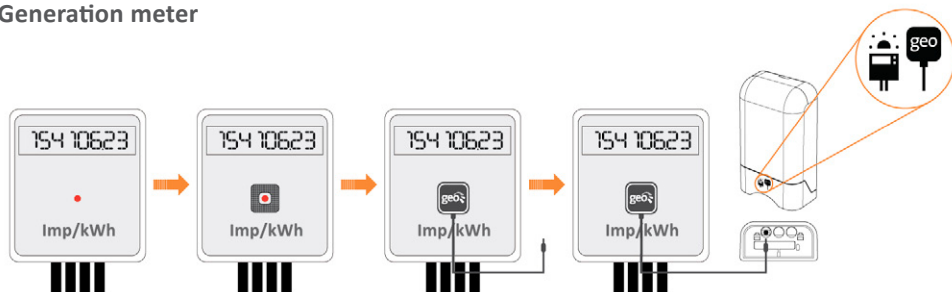


Step 4 - Installing meter sensors

The Chorus PV uses three sensors to collect microgeneration data:  (Generation LED sensor),  (Import LED sensor) and  (Import CT sensor)


Make sure you install the correct sensor on the correct meter. Make a note of the pulse output ('Imp/kWh') on the front of your meter.


Generation meter



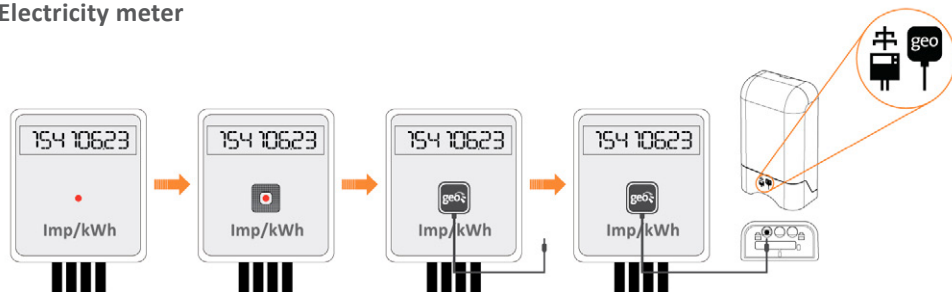
A. Installing the generation LED sensor

- Attach the Velcro around the pulse output on your *generation meter*.
- Place the **LED sensor** over the Velcro.
- Insert the sensor cable into the transmitter.

- Enter the Imp/kWh value from your meter by selecting:  » **Installation** » **Network** » **Meter sensors** » **LED pulse** » **Gen.LED**

Press  to return to home screen.


Electricity meter



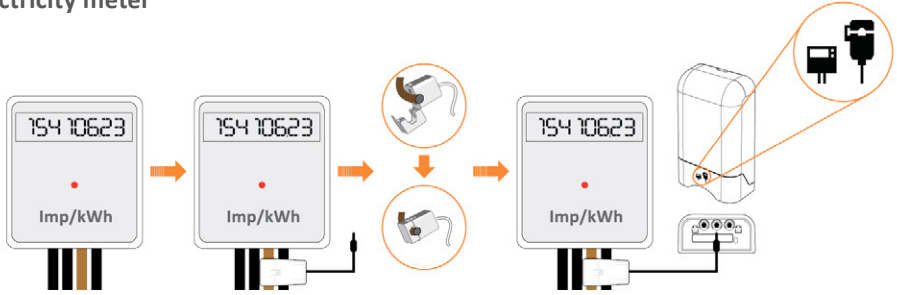
B. Installing the import LED sensor

- Attach the Velcro around the pulse output on your *electricity meter*.
- Place the LED sensor over the Velcro.
- Insert the sensor cable into the transmitter.

- Enter the Imp/kWh value from your meter by selecting:  » **Installation** » **Network** » **Meter sensors** » **LED pulse** » **Imp.LED**

Press  to return to home screen.

Electricity meter



C. Installing the import CT sensor

- Identify the live mains cable going into your *electricity meter* (it will be brown, red or have 'L' on it).
- Clip on the CT sensor.

- Insert the sensor cable into any of the three sockets underneath the transmitter. Press to return to home screen.

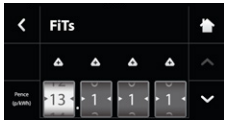
Step - Telling the Chorus about you

There are a few additional settings to complete to get your Chorus PV fully up and running. This can be done on the Chorus (see below) or from the energynote website (see energynote online service section).



Setting tariffs

Get the most accurate cost information on the Chorus PV by setting the import and micro-generation tariffs; this information is found on your utility bill. On the Chorus select » **Settings** » **Tariffs** » **Import tariff** Press to return to the home screen.



Setting your feed-in tariff (FiT)

Enter your feed-in tariff. You can find this on a recent utility bill. On the Chorus select » **Settings** » **Tariffs** » **Generation tariff** Press to return to the home screen.



Setting a budget

Tap Cost and scroll down to edit your budget. Set the desired monthly budget by using the and buttons on the left. Press to return to the home screen.

Display overview



Setup button

You can set up features, budgets & tariffs.

Home button

This takes you to the home screen of the feature you are viewing.

Message button

This takes you to your inbox, where you will find messages from your Chorus.

Electricity dial

The blue (outer) dial shows how much electricity is being generated by your PV array and the orange (inner) dial shows the amount of electricity being used in your home.

Generation threshold indicator

This will inform you when there is enough spare generation from the PV array for an appliance to be turned on.

Live generation power

The amount of electricity being generated by your PV array.

Live house use

The amount of electricity being used by your house.

Cost

This shows the cost of the electricity imported from the grid compared to your budget.

Electricity

This shows how much you are generating compared to consuming.

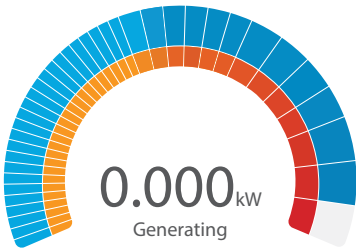
Income

This shows how much you are earning from your array. It's broken down by feed-in tariff, deeming and saving.

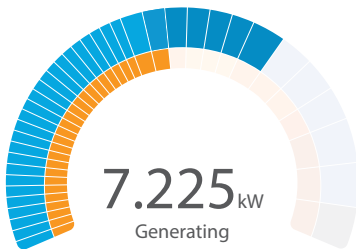
Using your display

Electricity ⚡

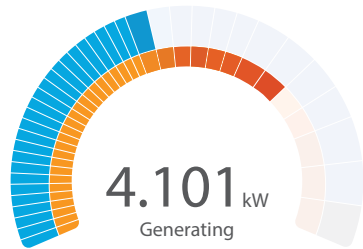
The home screen of the **electricity app** shows you both how much you are generating and how much your home is using. On the left hand side of the screen is the electricity dial. The blue (outer) dial shows how much electricity is being generated by your PV array and the orange (inner) dial shows the amount of electricity being used in your home.



If the blue dial is larger than the orange dial then you're generating more electricity than you're using – so you won't be paying anything for the electricity you're using. You're most likely to see this happen in the middle of a bright sunny day:



If the orange dial is larger than the blue dial, your PV array is not generating enough to cover your home energy use and you will be importing electricity from the grid – and therefore paying more. You're most likely to see this happen on a dark winter's day:



The live electricity values are measured in kilowatts (kW) and are shown in the centre of the dial. To give some idea of scale, a TV is roughly 0.2kW, a kettle 1kW and a power-shower 6kW. A mobile phone charger uses such a small amount that it might not even register. Best of all, your Chorus display uses hardly any electricity (and certainly doesn't register on the display).

As a guide, appliances that generate large amounts of heat (dishwasher, oven, toaster, kettle, washing machine, tumble dryer, power-shower etc.) use more electricity than those that don't (mobile phone charger, TV, radio, games console, WiFi modem etc.).

When you are generating more than you are consuming, you are exporting electricity back to the grid and the Chorus will show:



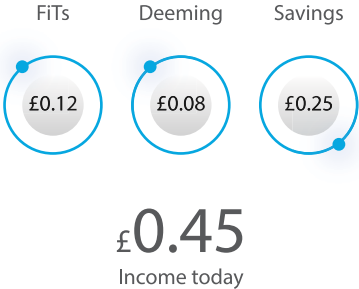
When you are consuming more than you are generating, you will be importing electricity from the grid and the Chorus will show:



See **Making the most of your electricity** for more information on how to maximise efficiency in your home.

Income 

The **income app** home screen on the left shows today's income for both the Feed-in-tariff (FiT) and deeming (if applicable).



To see your income for yesterday, this week, this month or all time, tap the screen and navigate down the menus to choose a period of time. A handy view of the current calendar month is also shown, on which the days you have had high income are highlighted by a darker blue.

Time periods

The Chorus uses rolling time periods based on whole days as opposed to fixed calendar periods to measure time. This makes it easier to compare energy use because the time is like-for-like as opposed to part-day or part-month comparisons. Chorus shows:

- Yesterday
- Last 7 days
- Last 31 days
- All time

Calculate your income

Feed-in tariff (FiT) / Generation tariff

When you generate your own electricity your energy supplier will pay you via a feed-in tariff (FiT). The amount is set by the Department of Energy and Climate Change (DECC) and is currently 16p* per kWh.

Rates change depending on the size of your system (those few of you with a system of over 4kWp are paid slightly less) and the rate of take-up (also called the regression rate), so for the most up-to-date information check with the DECC at www.gov.uk/decc or the Energy Saving Trust www.energysavingtrust.org.uk

Deeming / Export tariff

Now your solar panels are up and running you will, at some stage, generate more electricity than you need to use. This is most likely to be when the sun is shining and you're out for the day. So as well as your FiT/generation tariff you can sell extra units back to your supplier on an export tariff.

Because it's not possible for your energy supplier to measure exactly what you are exporting, the energy suppliers use deeming. This is a scheme whereby the energy supplier assumes that you export 50% of what you generate. So if you are paid 4.5p per kWh, you would work out:

kWh generated x 4.5p x 50%.

How much you are paid depends on when you fitted your solar panels.

Applied for FiT on or after August 2012:

4.5p (£0.045)* per unit x 50%

Applied for FiT before August 2012:

3.2p (£0.032)* per unit x 50%

*All rates/tariffs as at March 2013

You can enter these amounts onto the Chorus here:

✂ » **Settings » Tariffs » Generation tariff**

If you've owned a PV array for longer than your Chorus, you probably have an idea of the income so far. You can add this value to the data in your Chorus here:

✂ » **Installation » Prior income**

This value will be added to the all time income value in the income app.

PV array size

You need to tell the Chorus how big your PV array system is so that it knows the right number of segments to use on the energy dial (blue).

You can tell the Chorus about the size of your system here:

✂ » **Installation » Array size**

Use the – and + buttons to adjust the array size (from 1 to 15). If you aren't sure what size your system is, contact your installer.

Calculate your savings

Using the electricity you generate as opposed to electricity bought from the grid saves you money, obviously. But how much? And when? We show you just how much you're saving on the income app; Scroll down underneath the calendar.

The amount of money saved depends on your tariff. For example, if you use 4kWh of generated electricity and you pay 16p/kWh for your electricity from the grid then it would work as follows:

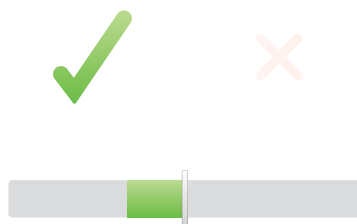
kWh of generated electricity used x cost of grid electricity = 4 x 16 = 64p

It's simple: the more you use your own generated electricity, the less you'll import from the grid and the more you'll save. If you navigate further down into the income app you can view savings by time period.

Cost

Any electricity you import from the grid you will be charged for. By using the electricity you generate as efficiently as possible, you can aim to keep any import down to a minimum.

To help keep any eye on your costs the Chorus gives you a way to set an appropriate monthly budget. This budget is updated during the day to show you



£0.15

Under budget today

your progress (good and bad!).

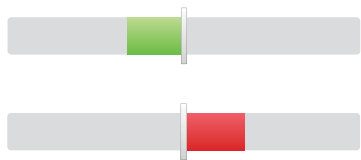
Setting a budget

Tap the **cost app** screen and scroll down to **Edit budget** in the menu. To set a monthly budget that is appropriate for you, take a look at a few recent electricity bills to get an idea of your typical monthly cost.

For example, if you used £120 over the last 3 months, divide the total by 3 and set a budget of £40 per month.

The home screen of the cost app shows whether you are currently below (tick icon) or above (cross icon) your budget at any time of the day. The Chorus learns your energy use pattern as you use it, so after a few weeks it will give you an accurate, personalised indicator of how well you are


doing on any particular day.
The swingometer provides an indication of

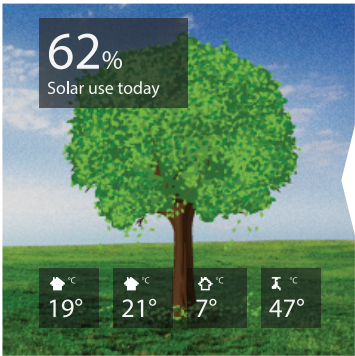


how much above or below budget you are.
Tip: If you're always under budget, why not reduce it to make it more of a challenge?

Making savings

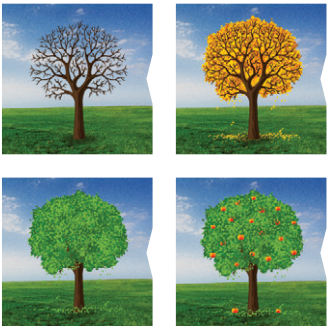
Tapping the cost app will show the times during the day you are using the most energy – in other words, when it's costing you the most. If possible, try to use energy-heavy appliances (like your dishwasher or washing machine) either during the middle of the day (in sunlight), or at night (if you have a cheaper night-time tariff).

Environment 
Using the electricity you generate doesn't just save you money, but also helps the environment. That's mainly because the energy you generate at home is carbon neutral (i.e. no power station). The environment app shows what percentage of the electricity you generate you have used in your own home at that point in the day and how much carbon you have saved.



The higher the percentage, the more of your own electricity you've used and the kinder you are being to the environment. Higher percentages mean healthier looking trees on the screen.

Tip: Try to get the tree to bear fruit as often as possible, that way you'll know you're making a difference.



Tap the environment app to read more information about your day's environmental impact. If you scroll down the menu on the right you'll see the all time carbon counters with the amount of carbon you've saved or generated in kg.

Making the most of your electricity

To save the most money on your bills and have the least impact on the environment, you should aim to use as much of your own generated electricity as possible.

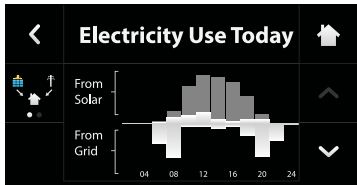
Generation vs. Importing

Of course your PV array will generate the most amount of electricity during bright sunny days, so that's when you'll have the most to use. But even on cloudy days your PV array is generating electricity for you. As with sunny days, the best times are in the middle of the day when the light is strongest.

To see the balance of your generation against use over the day, enter the electricity app by tapping the screen.



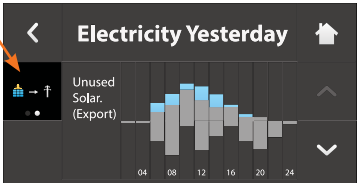
This graph shows generated electricity along the top and imported electricity along the bottom.



To see the biggest reduction in your bills, you should aim to have as little as possible in the bottom part of the graph (as this is the electricity you're importing from the grid).

We understand that it's not always possible to avoid importing electricity from the grid, especially as during the night your PV array won't be generating at all. This makes running lighting and heating difficult without importing from the grid.

However, if you tap the excess generation button, it will highlight the generation button



excess generated electricity in blue that you didn't use. It's then possible to reschedule energy-hungry tasks from the night to the day. Using appliances like dishwashers, tumble dryers and washing machines in the middle of the day will make sure they use generated electricity rather than imported grid electricity. Some appliances, like dishwashers, now have timer delay features, so you could set them to run when it's most efficient to do so.

To help determine when it's best to turn on energy-heavy appliances, the Chorus has a generation threshold indicator.



You can see this in the centre of the electricity dial when you're generating significantly more electricity than your house is using at that time. Whenever you see this symbol you should think about turning on an energy-heavy appliance.

The default generation threshold is set to show when you are generating 0.750kW more than you are using. This is enough to cover a significant amount of electricity used by one energy-heavy appliance. For example, it will cover most of the cost of running one cycle of a washing machine.

If that threshold is too high or low for you, you can change the generation threshold to something more suitable here:

» **Settings » Threshold**

The larger the value, the more appliances you'll be able to run using your generated electricity, but the less often you'll see the generation threshold indicator.

Top tips

- Use energy-heavy appliances (washing machines, dishwashers etc.) during the middle of the day.
- Use the generation threshold to determine the best times to use your generated electricity.
- Look at today and yesterday's electricity use graphs in the electricity app to measure how effectively you're using your generated electricity.
- Reduce your electricity consumption at night by changing to low energy lightbulbs and turning off any appliances that aren't in use (or could be run during the day).

Energynote online service

www.energynote.co.uk

If you don't already have one, a geo web pack is available which allows you to access all your energy data from your Chorus display online through www.energynote.co.uk



With energynote you can:

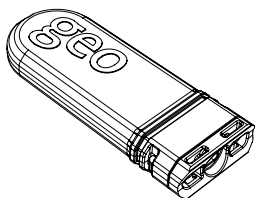
- Set up a personalised account with secure login.
- View all your energy data in detail, right back to the date you first installed your Chorus.
- Compare different energy data sets side-by-side.
- Use energynote's built-in analysis to learn more about your energy habits.
- See historic temperature data.
- Spot trends and patterns.
- Learn more about energy saving and the environment.
- Export your data as a data file (.csv) for further analysis.
- Energynote is also available to view on a mobile device, so you can look at your energy use in as much detail as you would like to see from wherever you have a connection.

Optional extras

Temperature sensors

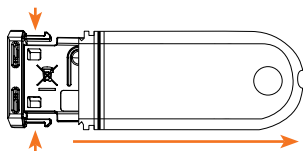
(available separately)

The Chorus can be used with wireless temperature sensors to measure room temperatures, hot water or even outdoor temperatures. You can measure room temperatures to compare the efficiency of your heating by comparing results, or to check that your home is running as warm or as cool as you would like.

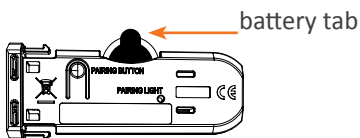


To pair a temperature sensor to the Chorus:

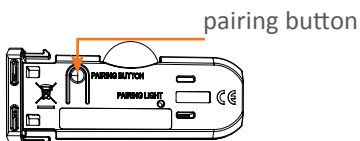
1. Squeeze the two clips on each side and slide the cover off.



2. Remove the battery tab from the temperature sensor.



3. Press the pairing button on the temperature sensor.

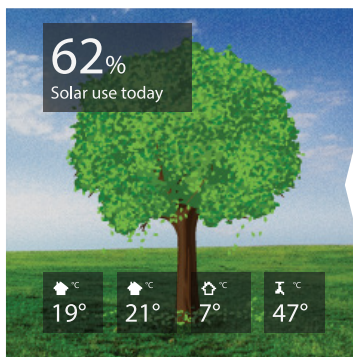


Select: ⚙ » **Settings** » **Installation** » **Network** » **Temperatures** and choose the desired temperature sensor.


Follow the on-screen instructions.

Note: the temperature sensor will automatically leave pairing mode after 30 seconds. If you have trouble pairing the sensor, make sure that you start the pairing process on the Chorus shortly after pressing the pairing button on the temperature sensor.

The temperature values are shown in the environment screen.

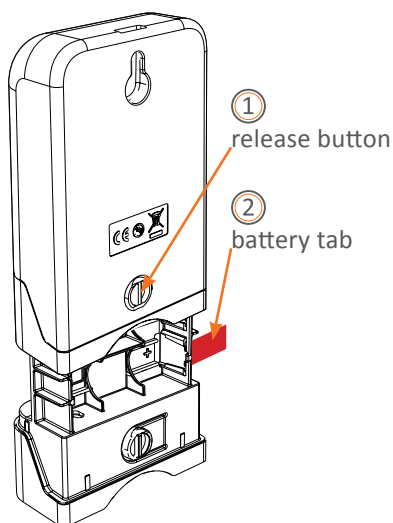



Pairing

The Chorus comes pre-paired to each of the three meter sensors. If you need to replace a sensor, you need to unpair the existing sensor by selecting  » **Installation** » **Network** » **Meter sensors** and choosing the sensor that you want to un-pair. Follow the on-screen instructions.


To pair a new sensor:

1. Open the new transmitter by pressing the button on the back and pulling the outer cover away.



2. Remove the red battery tab; the red light will flash to show that it's working.
3. Select  » **Installation** » **Network** » **Meter sensors** and choose the sensor that you want to pair. Follow the on-screen instructions.

Note: the sensor will automatically leave pairing mode after 30 seconds. If you have trouble pairing the sensor, make sure that you start the pairing process on the Chorus shortly after pressing the pairing button on the sensor.

If you need to replace the bridge and re-pair another one, unpair the bridge by selecting  » **Installation** » **Network** » **Internet bridge** and follow the on-screen instructions.

Now follow the instructions to connect to the internet in Step ② in Setting up.

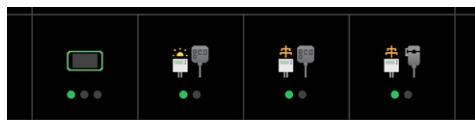
FAQs

Q. Why is my display not showing any readings?

A. This could be because one of your transmitters is out of range and isn't communicating with the display. This could be because:

1. The Chorus is out of range of the transmitter. You can try moving the display to a position where it is closer to the transmitters or to where it gets a better radio signal.
2. The batteries could be running low in the transmitter; please insert new batteries.

To see the status of your wireless sensors go to: 🗝️ » **Installation » Status** If the status is green then the signal is fine; red shows a problem.



Q. Why is my display not showing online?

A. Make sure that your Chorus is connected to your bridge and that the bridge is connected to the internet. To see the status of the bridge select:

🗝️ » **Installation » Status** and scroll down to the bridge icon 🌐. A green light shows that the Chorus is connected to the internet.

An amber light shows that the bridge is not connected to the internet. Make sure you have an internet connection (e.g. check your laptop can find web pages). If your other devices appear to be working correctly try connecting the bridge to another port on the back of your router (most routers have four or more ports).

A red light shows that the bridge is not paired, or is paired but not communicating with your Chorus. Tap the icon for a detailed explanation of the current status.

Q. How do I import the Chorus PV data into Excel?

A. To import Chorus PV data into another application (e.g. Excel), visit your Settings page on energynote and then export the data as a comma separated file (*.csv)

Q. Why has the display turned off?

A. The Chorus has a low power mode where it turns the screen off and lights the green LED on the front to show that it is still on. By default, this happens at night between the hours of 10pm and 6am if the Chorus has not been used for 10 minutes.

To change the times that the Chorus is in low power mode, select:

🗝️ » **Settings » Low power mode**. If you do not want the Chorus to enter low power mode at any time, set the start and end times to be the same.

The low power mode saves about 60% of the energy that the display uses. While in low power mode the Chorus continues to record energy use and upload information to the web via the bridge as normal.

Q. How do I clear all the data on the display?

A. If you wish to clear all your recorded data on the Chorus, select:

🗝️ » **Installation » Clear data**. This will remove all your data from the Chorus but leaves all the sensors paired. Please note that this will not clear any data from energynote.

Technical specifications

	Chorus	Transmitter	LED reader
Voltage	5V (100–240V PSU supplied)	3 x AAA 1.5V batteries	N/A
Input	<1.0W	0.2W	N/A
Operation	-20°C to 50°C	As the Chorus	As the Chorus
Humidity	85% non-condensing	As the Chorus	As the Chorus

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