



Pay-As-You-Go Market Check Testing Policy

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Pay-As-You-Go (PAYG) Market Check Testing is used to assess the basic functions of PAYG solar home systems and pico-PV products. The procedures are intended to test features specific to the PAYG system that are only functional in the intended location of use, and could not be tested at a laboratory that is outside the company's service area. These procedures are supplementary to the methods described in IEC TS 62257-9-5 and are not conducted during a typical Market Check Test, which tests additional quality and durability aspects of both PAYG and non-PAYG products. The goal of the PAYG Market Check Test is to:

- Determine whether the product services are cut off due to non-payment
- Verify that solar charging is allowed in the instance of non-payment
- Assess the metering accuracy of the payment system
- Evaluate the durability of keypads and other system parts

How frequently does VeraSol conduct PAYG Market Check Testing?

PAYG Market Check Testing may be conducted at any stage of the product life before it gets to the end user and is typically only conducted when concerns arise regarding the function of a product's PAYG system. Product selection and frequency of testing is at the discretion of VeraSol.

How are samples selected for PAYG Market Check Testing?

For PAYG Market Check Testing to occur, an agent of VeraSol will randomly procure samples from retail outlets in the market. VeraSol or an approved third-party agent may also randomly procure product samples stored at warehouses, distributorships, factories or other bulk storage locations. The VeraSol team may periodically ask manufacturers or distributors to provide a list of no fewer than 10 outlets to enable sampling. Sampling locations may be chosen from a subset of those outlets or from others that are independently identified.

How does PAYG Market Check Testing work?

PAYG Market Check Testing may be conducted with one or more samples. Tests may be performed separately or simultaneously on the selected samples depending on the availability of space and equipment needed for testing. A sample is considered the main control box and all included light points that are powered from the control box. Because the main control box and the lighting points are the main indicators of PAYG functionality on a product, the testing does not include any system appliances that are independently powered by their own battery or not affected by the PAYG functionality of the system. Where necessary, the PAYG Market Check test methods can be adapted to test appliances that are powered by the main unit and can be affected by PAYG system functionality of the sample product.

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Prior to testing, a minimum PAYG subscription indicated by the distributor or retailer is purchased for the sample to monitor the product PAYG behavior and create a baseline for the testing. For products that have a visible charge indicator, the charge status is recorded at every step of the testing procedure and instances that the sample is not performing as expected are recorded for further follow up.

If the results of the tested samples meet or exceed the applicable Quality Standards, no further action is required. However, if the results indicate possible deficiencies in PAYG performance, VeraSol will provide the test findings to the respective company through a letter or email notifying the company of the need to either address the issue or provide a plan and timeline detailing how they are going to address the issue. (Depending on the changes required, the product may need to undergo a repeat PAYG test with a different sample purchased from a retailer in the same country as the first sample to verify that the issue was addressed and that the product meets PAYG functionality expectations). If the company disagrees with the findings or is reluctant in accepting the findings from the sample, additional or repeat testing will be conducted by VeraSol on the same sample product in the intended country of use. VeraSol may charge the company a fee to cover costs of the repeat testing. The additional or repeat testing will focus only on aspects of the product that appeared to have deficiencies according to the PAYG Market Check Testing results. If the results meet or exceed the Quality Standards, no further action is required.

What happens if the company is irresponsible to VeraSol PAYG report with product deficiencies?

If a company does not respond within two-weeks after VeraSol has shared the report with product deficiencies, the product will lose program support and be removed from the website.¹ If the company then requests to have the product re-listed, the company would need to describe how the deficiencies were addressed and the product would need to undergo another test with a different sample purchased from a retailer in the same country as the first sample to verify that the issue was addressed and that the product meets PAYG functionality expectations.

Who pays for the second PAYG Market Check Testing if a repeated test is required to either verify results or verify that corrections have been made?

VeraSol would purchase the product for the repeat test from the retailer and cover delivery fees to the testing location. However, all costs incurred by VeraSol for the repeat test will be charged to the company. Such costs will include, but are not limited to, the repeat sample cost, sample delivery fees, and testing fees. The retailer or distributor for the second sample purchase remains at VeraSol's discretion.

How is the PAYG Market Check Test conducted?

The test methods VeraSol uses to conduct PAYG Market Check tests are detailed in Annex 1. These methods are not included in the documents VeraSol references for certification testing of systems (IEC TS 62257-9-5 and IEC TS 62257-9-8), but VeraSol reserves the right to base certification decisions regarding program support and inclusion on the VeraSol website on the methods in Annex 1.

Does VeraSol conduct any other forms of market monitoring?

VeraSol also conducts **Market Check Tests** at regional and international laboratories following the Market Check Method detailed in IEC TS 62257-9-5 and **Market Observations** in which VeraSol staff or third-party agents examine certified products in the marketplace or online. For more information on these other market monitoring activities, please see the [Market Check Testing Policy](#).

Annex: Draft PAYG Market Check Test Procedures

Purpose:

These procedures are intended to be performed by a VeraSol, World Bank, or other program staff member in their office to assess some basic functions of pay-as-you-go (PAYG) solar home systems but could also be conducted at a test lab located in the market where the PAYG product is sold. The procedures are intended to test features that are only functional in the intended location of use and could not be tested at a lab that is outside the company's service area. The draft test procedures described in the following pages aim to accomplish the following:

- *Determine whether the product services are cut off due to non-payment*
- *Verify that solar charging is allowed in the instance of non-payment*
- *Assess the metering accuracy of the payment system*
- *Evaluate the durability of keypads and other system parts*

Quality Standards:

While all portions of IEC TS 62257-9-8 are applicable to PAYG products, there are four items that are specific to PAYG products:

- Effects of PAYG on run time due to potentially increased standby loss
- Accurate metering
- Allow solar charging regardless of if service is paid (with exceptions made in certain circumstances)
 - Note: the requirement for the solar module to charge the battery may be waived for lithium-based batteries if the product is designed to protect the battery from damage when not charged for extended durations and shall:
 - Ensure the product can still safely charge when payment is made and the charging system is reconnected.
 - Consider both the discharge to operate the product and the self-discharge of the battery.
 - Prevent the battery from being charged if it has been discharged to an unsafe voltage.
- Quality and durability of PAYG parts, e.g., switch test for keypads

The test methods below examine the product's relative metering accuracy as well as if solar charging is allowed regardless of payment. As the product is being used during testing, the tester will be assessing the quality/durability of the PAYG parts, e.g., faulty keypads.

If the tests using the light meter are included, the testing will also examine the effects of PAYG on the full-battery run time; these tests will provide estimates of the full-battery run time, though if an issue is identified, additional laboratory equipment for measuring current and voltage may be required to make a final assessment.

Proposed testing (to be conducted by World Bank or other program staff):

Required Equipment:

- Solar product on a PAYG payment plan
- Location where solar product can be left on to discharge and charged via its PV module.
- Watch, phone, or other timing device

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If testing using a data-logging light meter is needed², the following additional equipment is required:

- Computer to download light meter data and record observations [note: ExTech Data-Logging Light Meter software is only available for Windows and not Mac]
- Data-logging light meter
- Light-tight cardboard box large enough to enclose all of the product's light points, and control unit (if necessary), and the light meter with some space in between

Preparation:

- Procure one or two samples from a distributor.
 - a. If available, one sample may exhibit the relevant issues raised by a customer or distributor that triggered the testing
 - b. If a sample with a known issue is used, a second sample, preferably unopened, where issues have not yet been observed should also be tested

Note, the process of procuring a PAYG product on a PAYG payment plan can be relatively difficult, require a credit assessment (including provision of contact information for a credit guarantor), and may take up to 5 days to finalize the sales process. Take note of the available payment plans and payment methods to ensure that you pick those that will allow you to run the PAYG functionality tests. If available, a minimum payment plan of daily and a maximum of weekly is a better fit for the test (if only monthly plans are available, testing may need to be adapted). In many cases, the user must have a local mobile phone number that is registered to a mobile money service acceptable by the vendor as mobile money is the most accepted mode of payment for most PAYG model users. If someone is purchasing the product for someone else to conduct the test, the person purchasing the product should be locally established, at least for the period of the test and should have an active local mobile contact that is registered to mobile money should they choose to register their mobile number as the primary contact for the purchase. Otherwise, it is possible to make payments with one number but register another local number from the test lab as the primary contact for the sale. This way, the person testing can be directly notified of all transaction activities, including notifications on payment expiry. Be aware that in nearly all cases, the VeraSol will need to be responsible for the full payment of the system even if the PAYG system is only used for a few weeks.

- Deliver the sample(s) to the staff member's office. Alternatively, the test can also be conducted at the staff member's home if there is enough space to run the test
- The distributor should provide the staff member with the same introduction to the products that is provided to the typical customer. If the typical customer is given no introduction, then no introduction should be provided to the staff member.
- The staff member shall completely read all instructions provided with product; do not reference web materials unless specifically instructed to by materials included with the product.

Procedure:

² See internal VeraSol "Report on Pilot PAYG Metering Accuracy and Battery Charge Test" for more details on determining whether these tests and relevant equipment can be excluded.

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This procedure shall be performed on each sample. If equipment and space are available, both samples can be tested simultaneously. Otherwise, each sample can be tested separately. Record any instances that the samples do not perform as expected while carrying out the following instructions.

A sample is considered the main control box and all included light points that are powered from the control box. Non-lighting appliances and appliances with their own batteries (e.g., portable torches and radios) need not be included in this testing.

If the product includes a battery or charge indicator, note the status of the battery/charge at each step. Record all notes in the attached spreadsheet.

1. Set up the product according to the instructions provided with the product. Note any instructions that are missing or misleading, such as directions regarding how to make all permanent connections, connect appliances or PAYG components, or any other steps that are required to be completed before using the product.
2. Discharge the sample as follows:
 - a. Make the minimum payment available that allows the sample to fully discharge.
 - b. Discharge the sample's battery by turning on the lamps until it no longer provides usable light. Note, for a light to be considered usable, a person should still be able to read with it. The sample's PV module shall not be plugged in during this step.
3. After the payment period has lapsed, attempt to fully charge the sample to check that the product can be charged without payment.
 - a. Make sure the sample will not turn on due to lack of payment.
 - i. If the sample does not cut off immediately after the payment period has lapsed, check every day to see if the lamp(s) can still turn on. Record how many days are required before the sample is cut off due to lack of payment. Then continue with steps b. and c. If the product does not cut off after 7 days, skip to step 5.
 - b. Charge the sample via the included solar module over at least 3 days of typical sun for area that receive less than 6 hours of peak sun a day. Do not count rainy or cloudy days. Follow any instructions provided with the product for solar charging.
 - c. Record the weather conditions daily during the solar charge.
 - d. After confirming that the battery is fully charged, disconnect the solar module from the sample.
4. Estimate its lighting full-battery run time on the brightest setting
 - a. Make the minimum payment available that will provide enough service for twice the sample's full discharge. (This should ensure the lights will not cut off early due to lack of payment. For example, if the rated full-battery run time with all lights on high is 8 hours, then you will purchase 16 hours (or nearest allowable increment).)
 - b. Place all the sample's light points in a light-tight enclosure, e.g., cardboard box, with a data-logging light meter installed on the opposite side.
 - c. Turn all the light points on in their brightest settings. Then quickly close the enclosure and turn on the data-logging light meter.
 - d. Take note of the recorded illuminance when you turned on the lights. Let the setup sit overnight. If usable light is still present the next morning, leave the setup how it is and allow it to sit until the lights no longer provide usable light.

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- e. When the sample is no longer providing usable light (peek inside the box), download the light meter data, turn off the lights, and analyze the data /send it to VeraSol Quality Assurance Team staff for analysis.
- f. If the estimated full-battery run time is notably lower than the rating (approx. < 80% lower), then it is likely the sample was not receiving a charge during Step 2: "Attempt to fully charge the sample".

5. Test the full-battery run time again after the PAYG fee is paid and the sample is fully charged.
 - a. Repeat steps 3 and 4 with one exception – prior to charging the product, make the minimum payment available that will allow the sample to charge the product over at least 3 days of typical sun. Try to configure the light points and light meter in the cardboard box in a similar arrangement as was used in the previous test.

At this point we have

- *checked to see if the product cuts off for non-payment*
- *checked that solar charging is allowed regardless of if service is paid, and*
- *established an estimated full-battery run time for the sample's brightest lighting setting.*

6. Estimate the sample's metering accuracy.
 - a. Prepare the sample so that
 - i. it is fully charged (Again, prior to charging the product, make the minimum payment available that will allow the sample to charge the product over at least 3 days of typical sun. Do not count rainy or cloudy days and record the weather conditions daily. Follow any instructions provided with the product for solar charging.)
 - ii. the service is cut off due to lack of payment. (Since you made payments to ensure you could fully charge the product, you will need to wait for the payments to run out before starting this test.)
 - b. Physically place the sample so that
 - i. all the sample's light points are in a light-tight cardboard box with a data-logging light meter installed on the opposite side (ideally in the same configuration as used in the prior two tests), and
 - ii. the sample is connected to receive charge via the solar module - do not disconnect the solar modules during the remainder of this test.
 - c. Aim to continue the remaining steps later in the day, e.g., before leaving work for the day. Steps e and f will be repeated daily, until the credit runs out.
 - d. Make the minimum payment available and record the time and date.
 - e. In the evening, before nightfall (or before leaving work), turn all the light points on in their brightest settings. Then quickly turn on the data-logging light meter.
 - f. Aim to turn off the light points during the day and continue turning them on before leaving work for the day. Daily, after turning the lights off (i.e., when you arrive to work in the morning), download the data from the light meter.
 - g. 24 hours after the payment period has completed, download the light meter data, turn off the lighting samples, and analyze the data /send it to Schatz for analysis. Note that there are multiple methods in which the product's service is advertised; three examples are described below.
 - i. *cost per amount of time the product could provide service, e.g. 1 day, 1 week, 30 days*

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- ii. *cost per amount of time the product provides service, e.g., 1 full-battery run time or 8 hours, which could be used over multiple days*
- iii. *cost per amount of energy used, e.g., 1 kWh (note, this option will need to be assessed in a lab setting)*

h. If applicable, repeat the above steps with a second payment amount. Be sure that at least one payment period testing spans at least three evenings of use.

About VeraSol

An evolution of Lighting Global Quality Assurance, the VeraSol program supports high-performing, durable off-grid products that expand access to modern energy services. VeraSol builds upon the strong foundation for quality assurance laid by the World Bank Group and expands its services to encompass off-grid appliances, productive use equipment, and component-based solar home systems. Like Lighting Global Quality Assurance, the VeraSol program is managed by CLASP in collaboration with the Schatz Energy Research Center at Cal Poly Humboldt. Foundational support is provided by the World Bank Group's Lighting Global program, UKaid, IKEA Foundation, Good Energies Foundation, and others.

Please visit VeraSol.org for more information.