

Frequently Asked Questions (FAQ) about the SCI Performance Evaluation Process (PEP)

Consumers can consider many factors (standard cooking power, solar cooker type, size, capacity, weight, appearance, price, etc.) when purchasing or making a solar cooker. SCI developed its Performance Evaluation Process (PEP) for measuring standard cooking power values, which can help inform consumer choices and decisions. Below are answers to some frequently asked questions about SCI's PEP solar cooker testing. This PEP FAQ is intended as a complement to information provided in the [ASAE S580.1 protocol for Testing and Reporting Solar Cooker Performance](#) and SCI's PEP results reports available here: <https://www.solarcookers.org/work/research/results>

SCI provides this information to benefit solar cooks and future solar cooks, agencies, and manufacturers; but this information is proprietary, so please do not publish it further without written permission from SCI. Updated 8 Aug 2022.

General questions about PEP

1. What is the Performance Evaluation Process (PEP)?

The Performance Evaluation Process (PEP) is SCI's solar cooker testing platform. The PEP applies an internationally-agreed-upon method for determining the thermal performance specification for solar cookers. The PEP automates the [ASAE S580.1](#) protocol, which is part of the following standards for clean cookstoves and clean cooking solutions produced and published by the International Organization for Standardization (ISO):

- [ISO 19867-1:2018](#): Clean cookstoves and clean cooking solutions — Harmonized laboratory test protocols — Part 1: Standard test sequence for emissions and performance, safety and durability
- [ISO 19869:2019](#): Clean cookstoves and clean cooking solutions — Field testing methods for cookstoves

2. What does the PEP measure?

The PEP provides a single measure of thermal performance, which is the value for standard cooking power (in watts) of a solar cooker. The standard cooking power is the uptake of power in a water test load when the temperature difference between the ambient air and the water test load in the solar cooker is 50 °C.

3. Why is the standard cooking power determined for when the temperature difference between the ambient air and the water test load is 50 °C?

This 50 °C temperature difference is part of the definition for standard cooking power. This temperature difference is meaningful because it generally indicates that the temperature of water inside a solar cooker has reached the temperature needed for the onset of cooking.

4. Is the PEP a pass/fail test?

The PEP is not a pass/fail test. That said, the cooker needs to be able to cook. From the PEP perspective, for any solar cooker with a standard cooking power value greater than zero, the water load would have at least reached 50 °C above ambient temperature, which is about the onset temperature of cooking.

5. Why is the PEP important?

PEP results provide a performance specification useful for consumers and investors to make informed decisions when comparing solar cookers. PEP measurements also provide credibility to the solar cooking sector and products.

6. Why should I have my solar cooker PEP tested?

The PEP tests solar cookers according to ISO standards which are beneficial for the solar cooking sector. ISO standards benefit business and can help shape national policies for clean cooking. SCI also promotes PEP tested solar cookers through its publications and highlights them through presentations and exhibitions at high-impact events, such as United Nations conferences.

7. Why is water used as a test medium instead of food?

The ASAE S580.1 protocol specifies water as the test medium. Water is nearly uniform and available worldwide and is useful for producing repeatable results during a series of tests. Thermal performance measurements using food would introduce challenges for sample uniformity and subjectivity in determining when the food is cooked. Beyond the scope of the ASAE S580.1 protocol, food can be used in comparative tests, such as:

- The controlled cooking test, Bailis R. 2007. Controlled Cooking Test, Version 2. Available from <https://www.cleancookingalliance.org/binary-data/DOCUMENT/file/000/000/80-1.pdf>
- ISO methods: specific fuel consumption measurement – adapted from the controlled cooking test – (ISO 19869:2019, Clause 7.6) and uncontrolled cooking test (ISO 19869:2019, Clause 5.3.3).

8. What parameters do SCI's PEP test stations monitor?

SCI's PEP test stations monitor four parameters: temperature of water in the solar cooker, ambient air temperature, solar irradiance, and wind speed. SCI's PEP test stations also monitor time and position, as they are equipped with global positioning systems (GPS).

9. What is the temperature range during testing?

During PEP tests, water temperature ranges from 5 °C above ambient air to 5 °C below local boiling point. PEP results are based on changes in water temperature while it is in the liquid phase (below its local boiling point).

10. What are typical testing conditions?

Typical testing conditions are sunny days with low wind. The ASAE S580.1 also suggests that the ambient air temperature range from 20 to 35 °C while testing.

11. Why does SCI charge \$1000 for PEP solar cooker testing?

While SCI is a nonprofit organization, it needs to cover its costs. The current PEP fee covers SCI's costs of the time it takes for PEP testing (setup, 3 days of testing, data analysis, report generation, etc.) and for developing and maintaining the program.

12. Where can I find out more information about SCI's PEP solar cooker testing platform?

Here are links to additional information:

- SCI Website: <https://www.solarcookers.org/work/research>
- Solar Cooking Wiki: https://solarcooking.fandom.com/wiki/Performance_Evaluation_Process
- PEP manuscript published in the proceedings for the 2021 Solar World Congress: <http://proceedings.ises.org/paper/swc2021/swc2021-0078-Bigelow.pdf>

Specific questions about PEP reports

13. What do PEP results mean?

Keep in mind that the standard cooking power is the uptake of power in water. Since power can be defined as a change in thermal energy per time, the standard cooking power can be interpreted as the heating rate (change in temperature per time) for an amount of water in a solar cooker that is proportional to the size of the solar cooker. Hence, the standard cooking power is a relevant specification for a solar cooking appliance. For more about the performance of a specific PEP tested solar cooker, refer to its PEP results reports for heating curves and the plot of the standard cooking power.

14. Why do some reflective-panel cookers have a higher standard cooking power value than some box ovens?

While it may seem counter intuitive, there are several factors that could lead to a reflective-panel cooker having a higher standard cooking power than a box oven. If the size of the intercept area of the reflective-panel cooker is larger than that of the box oven, it is likely capturing more sunlight energy to convert to thermal energy. PEP results are typically acquired on sunny days and apply to all facets of an entire solar cooking system, including the material and design of the greenhouse and the cookware characteristics. When selecting a solar cooker, however, one may want to keep in mind the benefits of box ovens, such as their inherent heat-retention quality, which can keep food cooking during intermittent clouds.

15. Does the PEP measure efficiency?

The PEP measures standard cooking power (in watts). While this is not an efficiency measurement, it could be interpreted in terms of efficiency by accounting for the solar cooker's effective intercept area – the solar collection area of the solar cooker that faces directly toward the sun.

16. Is a low R^2 bad?

Low R^2 (less than .75) is not bad. The ASAE S580.1 testing protocol states that the coefficient of determination (R^2) or proportion of variation in cooking power should be higher than 0.75 or specially noted. SCI is noticing a trend that for powerful solar cookers with near-linear heating curves the R^2 value can be less than 0.75. Lower R^2 values also indicate that the rate of temperature increase is independent of the ambient temperature within the temperature testing limits.

17. Does cookware matter?

Yes, cookware matters. Cookware material, size, and external color/coating can have a measurable impact on standard cooking power. Cookware is part of a solar cooking system, some cookware is more appropriate for certain types of solar cookers than others, hence, the cookware type is noted in PEP results reports.

18. Does the greenhouse matter?

Yes, like cookware, the greenhouse is a part of a solar cooking system. Greenhouse material, thickness, smoothness, and effectiveness can have a measurable impact on PEP results; hence the greenhouse is noted in PEP results reports.

19. Where can I find more information about the components on the SCI PEP test station?

PEP results reports provide additional information for some of the instrument components in the PEP test stations, such as the thermocouples, pyranometer and anemometer. Also, more information is in the PEP manuscript

published in the proceedings for the 2021 Solar World Congress:

<http://proceedings.ises.org/paper/swc2021/swc2021-0078-Bigelow.pdf>

Additional questions relevant to testing

20. How do I arrange to have my solar cooker PEP tested?

If interested in having your solar cooker tested, please contact SCI through this webpage to arrange to have your solar cooker tested: <https://www.solarcookers.org/work/research/schedule-test>

21. Where can I get my solar cooker PEP tested?

SCI has PEP testing locations in California and in New York. SCI also has collaborations with stove testing centers in Kenya and Nepal, including the potential to travel for PEP testing in the field.

22. Is the cost of the cooker considered in the PEP test?

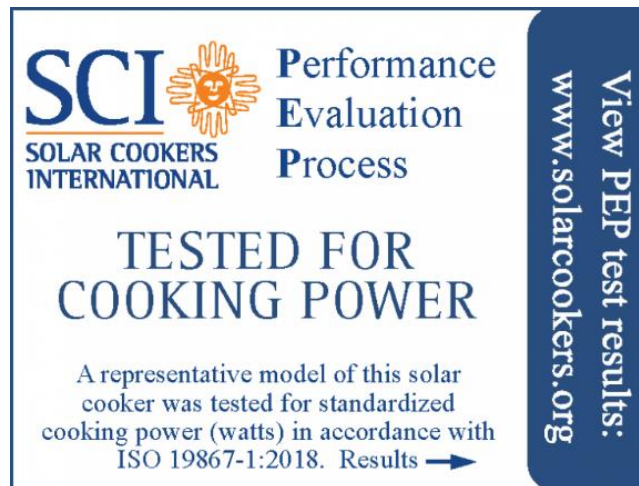
PEP results are independent from the cost of a solar cooker and SCI does not track prices for solar cookers. Please contact manufacturers and distributors directly for their latest prices. SCI has links to contact information for manufacturers in the table of PEP tested cookers on this site: <https://www.solarcookers.org/work/research/results>

23. How can I recognize PEP tested cookers?

Consult the table of results on the SCI webpage for viewing test results:

<https://www.solarcookers.org/work/research/results>

Please also look for this PEP tested label which manufacturers have permission to use once the testing process is complete and the PEP results report is approved by the manufacturer.



24. What other ways are there to test a solar cooker?

While SCI's PEP platform harmonizes with ISO standards for measuring performance of a solar cooker, the ISO standards also include testing protocol for safety, durability, usage, and usability.