Deciding whether to install solar panels on your home? New NIST web tool can help

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A software tool developed by NIST, called Present Value of PhotoVoltaics, analyzes the economic and environmental impacts of rooftop solar technology. Credit: B. Hayes/NIST

Whether it's to live more sustainably, save money or both, many people think about adding solar panels to their homes. Homeowners consider a number of factors, including which type of solar panel might work best

for them, when deciding whether the investment is worth it.

Now, an online software tool from the National Institute of Standards and Technology (NIST) can help answer homeowners' questions. The software is called $[PV]^2$ —Present Value of PhotoVoltaics—and it analyzes the economic and environmental impacts of rooftop solar technology. The tool can assist homeowners and even installers when evaluating rooftop solar photovoltaic systems.

Photovoltaics are semiconductor materials that convert sunlight to electricity. They consist of individual cells that form solar panels. But how can homeowners know if the technology is right for them?

To help answer this question, $[PV]^2$ uses a method called life-cycle cost analysis, which assesses the total cost of a structure, project or product over time. It takes into account various costs and can identify the most cost-effective options for the long term.

The idea for the tool came from NIST economist Joshua Kneifel when he was considering installing solar panels on his own home a few years ago. "Solar installers were providing some basic information on costs and savings based on simple and sometimes nontransparent assumptions. I wanted to determine whether installing solar was a better investment than simply investing that money instead, and no tool available at the time could do that," said Kneifel.

He ran his own calculations using an Excel spreadsheet but realized the format wasn't translatable for the average person. "I determined what was missing was a tool for a homeowner or solar installer to use to get standards-based, independent economic analysis of an actual quote to install solar for a specific house. I wanted to provide all the necessary details, accounting for all the potential complexities, while simplifying the experience for the user in a way that is digestible," said Kneifel.

When users access [PV]^2 on the web, they first encounter a landing page that introduces them to the online tool. The page includes links to a user guide that provides a quick tutorial on how the tool works.

The tool performs the bulk of the calculations and analysis, so users only need to have on hand two pieces of information: an actual solar quote—a cost estimate from a solar installer—and an electric bill. If a user doesn't have these items, they can enter an example quote and electric bill from the landing page in order to obtain a rough estimate.

Once they hit the start button, users must go through six steps, such as putting in their address or ZIP code, the electricity price found on their bill, information about the solar panel system, and any monetary incentives for which they are eligible. Users don't have to know all this information; some steps contain default information based on the latest research and data. The information that users enter is not stored on a server or on the web application, said Kneifel, protecting the privacy of a user's personal data.

"Once a user completes these steps, they hit the finish button and get a breakdown of costs, electricity savings and carbon footprint associated with the photovoltaic system. Graphs are also included, and everything can be downloaded in a spreadsheet or PDF," said Kneifel.

[PV]^2 uses the Economic Evaluation Engine (E3), an application programming interface (API) developed in conjunction with [PV]^2 by experts in the Applied Economics Office at NIST.

"The new concept is to provide a generic API that could be used as the 'back-end' calculation engine for multiple 'front-end' tools, such as a web application," said Kneifel. "This simplifies and speeds up future development of new tools and minimizes time and cost to maintain existing tools. The solar evaluation tool was a perfect use case to validate

and show the capabilities of the generic economic API and how it can be leveraged by other tools that assess long-term projects that require a life cycle perspective. For example, any building or facilities-related project targeting energy efficiency, sustainability or resilience could use E3 for the economic analysis."

The web application went through beta testing before becoming available for the general public and received feedback from beta testers, such as solar installers, homeowners who have recently installed solar panels, homeowners who have considered but not yet installed solar panels, and other tool developers. [PV]^2 can also be useful for solar installers needing to provide a transparent, independent solar panel economic analysis. "The hope is that the layperson can use this web application to do the same analysis I did to feel comfortable about my investment in solar," said Kneifel.

This is the initial version of the tool and new features are under consideration; users are welcome to provide feedback to further improve the tool.

Provided by National Institute of Standards and Technology

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