

PLUG-AND-PLAY PV FOR AMERICAN HOMES



1 CSE's plug-and-play PV concept spans all aspects of residential solar, from the modules to how the system communicates with utilities.

2 Solar panels are an increasingly common sight on homes, but high "soft" costs still affect adoption rates.

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Overview

The Fraunhofer Center for Sustainable Energy Systems (CSE) is currently conducting a 5-year research and development project focusing on the development of plug-and-play solar photovoltaic (PV) systems that can be purchased, installed, and connected by homeowners without the need to engage outside consultants or contractors.

This project is funded by the US Department of Energy's SunShot Initiative as part of a larger DOE investment aimed at developing technology solutions that reduce the "soft" costs of residential solar PV systems – the non-hardware costs such as permitting, inspection, and interconnection that now account for a significant part of the total cost of residential PV, and represent a significant barrier to the wider adoption of solar power in the United States.

Project Focus

Fraunhofer CSE will create technologies, components, systems, and standards that reduce the cost and complexity of residential solar PV deployment.

To accomplish this objective, CSE will leverage its R&D capabilities in photovoltaics, building energy efficiency, and distributed electrical energy systems. The Center will be further supported by a multidisciplinary team of equipment manufacturers, utilities, local governments, universities, and research institutions.

The ultimate aim is to develop a range of pre-configured systems that can be installed and commissioned by a homeowner within one day – all without the need for significant permitting, inspection and interconnection processes.

By removing these sources of "soft" cost, residential solar PV systems will be more cost competitive and attractive to homeowners, accelerating US solar adoption and production.



Project Objectives

- Develop a complete plug-and-play PV system, including all of the technological components necessary for simple installation
- Develop and demonstrate self-reporting capabilities that allow the system to communicate with inspectional services and utilities
- Develop a lightweight rooftop mounting system that requires zero or few roof penetrations
- Develop capabilities and protocols for automatic system configuration, performance monitoring and detection, and automatic utility reporting and grid interconnection
- Demonstrate field installation, commissioning, and interconnect of a plug-and-play PV system on a residential rooftop
- Achieve an overall system design, methodology, and aesthetic that is appealing to residential installers

Field Deployments

Annual rooftop installations in Massachusetts will be used to demonstrate project progress. Research for this project will be carried out in Boston, Albuquerque, and at partner facilities throughout the United States.

Technology Features

Key features of CSE's technology solution include:

- Lightweight solar modules
- Self-sealing roof mounts
- Distributed power conversion for safe and simple wiring on the outside of the building
- Self-testing system components
- A communications protocol that allows the installed system to easily obtain the necessary permissions needed to connect to the utility grid

Project Partnerships

CSE will leverage existing efforts by the City of Boston and the Commonwealth of Massachusetts to accelerate the deployment of solar PV systems, including the Solarize Massachusetts program, which aims to increase residential solar adoption and lower the cost of solar in Massachusetts.

Fraunhofer CSE's team will also work with the national code and standards community to identify hurdles to system deployment, propose code changes, and develop technologies that ensure compliance with local building requirements and regulations.

Project Team

Fraunhofer CSE's plug-and-play research is currently supported by multidisciplinary group of partners, including the following solar manufacturers:

- Lumeta Solar
- Petra Solar
- Tigo Energy
- 3L Power
- Schletter

In addition, the following team members will provide support with code, standards, demonstration, and validation:

- Sandia National Laboratories
- National Grid
- NSTAR
- Green Mountain Power
- Tufts University
- Vermont Law School
- Center for Environmental Innovation in Roofing
- City of Boston
- City of Worcester

3 Rooftop installations in the field will be used to demonstrate CSE's technology solutions.

4 PV-ready smart meters and pre-configured systems capable of interfacing with utilities are a part of the plug-and-play PV concept.