

## Smart Inverter Technology

*At its most basic, the inverter converts electricity from the generation resource on your property, such as a rooftop solar panel, from direct current (DC) to alternating current (AC), allowing the electricity to be delivered to the local distribution grid. This is important because electricity flows in AC through the grid and to your outlets.*



The ISO power grid is designed to operate within certain boundaries, and when electricity is generated that pushes the grid outside of those boundaries, power quality and reliability are threatened. If you've ever gone through a brownout, that could be the result of poor voltage quality on the grid. The transformer in your neighborhood usually ensures that voltage stays within that boundary, and technology in that transformer is used to maintain those voltage outputs. This equipment is designed to last decades. A smart inverter is simply an additional piece of software to control the actions of the inverter itself.

This nugget regarding the physics of electricity is important; electricity generated by rooftop solar panels produces electricity in DC, which means it must be converted into AC in order to be delivered into the distribution grid or used on site. If the sun was always shining and the sky was always clear, the need for a smart inverter would be less evident. But as clouds pass between the sun and the solar panels, the quality of electricity generated diminishes and the voltage of that electricity fluctuates wildly. This means that the distribution utility must handle and mitigate this poor quality electricity in order to maintain acceptable levels of voltage across the distribution grid and to your home. That transformer is now asked to perform far more often than it was envisioned, resulting in a reduction in its expected useful life. A smart inverter, attached to the panels and on the customer side of the meter, is capable of moderating the voltage or stopping the flow of poor quality electricity to the distribution grid. However, existing standards and interconnection rules utilizing those standards currently do not allow for the smart inverter and its functions to be operational. This is changing.

Starting in 2013, the California Public Utilities Commission (CPUC) initiated an effort to reform its interconnection standards, known as Rule 21. As part of this effort, the parties and the CPUC identified that smart inverters and changing the standards were important to support the development of smart inverters as a means to address physical impacts such as poor quality of electricity generated from rooftop solar. To meet this need, the CPUC and the California Energy Commission created the Smart Inverter Working Group (SIWG) to investigate the feasibility of smart inverters in California and recommendations for modifications to Rule 21 to mandate smart inverters as part of Rule 21. It first identified the need to update the standards governing interconnection and inverters: IEEE 1547 and UL 174.

Source: The SmartGrid Consumer Collaborative