# The Nuts and Bolts of PV

## *Maturing Solar PV Racking and Module Mounting Critical Bolted Joint Technologies for LCOE Reductions and Increased Reliability*

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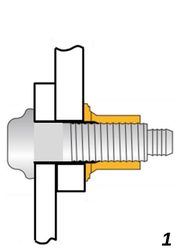
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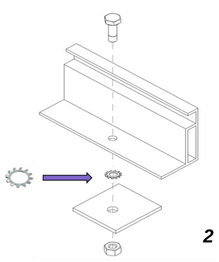
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## 3 goals for this poster session:

### 1. Raise awareness of the criticality of fastened joints in PV systems


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### The problem

- Fastened joints in PV systems are not given adequate attention in codes, standards, design, procurement, installation, and maintenance of PV systems.
- They are critical PV system components for securing structural and electrical system integrity.
- They have failed in the field and are often cited as the most common structural issue on PV systems.
- The impacts of failures can range from increased repair and maintenance costs to system damage and downtime to total system loss.
- There is a lack of data and knowledge on the actual prevalence of these failures, which types of fastened joints are more prone to failures, the mechanical failure modes, and the actual loading experienced in these joints.

### 2. Discuss and get input on ongoing SETO* funded PV fastened joints research effort. Highlight potential solutions.

**Goal of Research Effort:** To mature the state of fastened joints in PV systems and develop guidance that can inform future design, procurement, installation, financing and insuring of PV systems, and act as a compendium to codes and standards.


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Research Tasks will include (1) PV bolted joint taxonomy, (2) stakeholder interviews, (3) identification of codes and standards gaps, (4) structural lab testing, and (5) LCOE analysis. Final product will be a guidance document.

### Potential Solutions

- Design fastened joints well to account for dynamic loading
- Ensure quality installation
- Locking hardware to prevent self-loosening: lock bolts, Belleville washers, wedge-lock washers, thread lock
- Through bolting to stop progressive failures
- Follow manufacturer installation manuals
- Use more fastener locations, more contact surface area

### 3. Recruit participants for structured interviews on PV fastened joint issues, data, and experience.


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## We want your input!

Do you have experience with fastened joint failures or issues on PV systems? We are conducting interviews to gather information. All proprietary information will be kept anonymous and private. Scan QR code to share your contact information and background:

***Complete our survey***

Direct link https://www.surveymonkey.com/r/SETOSurvey or
Contact: James.Elsworth@nrel.gov

This effort will help quantify the prevalence of PV fastened joint failures, identify attachment methods that are prone to failure, determine environmental conditions that lead to failures, and highlight successful approaches to mitigating these failures.

***Solar Energy Technoloties Office**

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