View from the Trenches: connector reliability in the US An Independent Engineer's Perspective

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From the Fire Perspective

- Connectors remain the single most likely reason for a fire in a PV system. (by far)
- List of connector fires in order of likelihood
  - —Improperly assembled field-installed connectors (bad crimps and other mistakes)
  - —Poor quality connectors (bad metallurgy)
  - —Intermated dissimilar connectors (rare in fires)

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How to solve field-installation issues

- The “MC-4” style connector assembly requires skill that is often lacking in the field.
- The consequences of failures is rarely understood or witnessed by the field technician.
- Assumption that the inverter’s arc-fault detector will catch the problems is not always true—arrays have blind spots.
- Factory-installation needs to be the norm with a much higher emphasis on the training of the field technicians doing the field connections.
- Future is a connector that does not require as much skill.

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How to solve metallurgy issues

- Axial-style connectors have many shortcomings.
- Fretting is common with axial connectors when coatings are not durable enough.
- UL6703 is woefully inadequate to present any barrier to entry for poor quality connectors. (TC200—really??)
- The qualification requirements for connectors need to be at least an order of magnitude greater than they are today so that poor quality connectors never make it to market.
- Companies like SolarEdge and Enphase have been forced to do their own testing which have weeded out the vast majority of connector products on the market today.
- Raise testing and raise expectations—they are simple small parts

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How to solve intermateability issues

- First—intermating a bad connector with a good connector improves the bad connector.
- Connector standardization is very difficult when working around a product design that is owned by one company.
- The only way to truly achieve intermateability is for there to be a completely separate product so that we can see “what can be, unburdened by what has been…”
  - Why do we need a connector that can be easily taken apart?
  - What is wrong with irreversible connectors in utility scale and C&I for that matter?
  - Reliable, low-cost electrical connections is what is important—not how easy it is to take apart or replace.

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