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TECHNICAL NOTE

Topic: Repowering Grounded Arrays with Transformerless Inverters

This Technical Note applies to all transformerless SMA inverters.

As legacy PV arrays age and inverters fail, the topic of "Repowering" has become more and more relevant. Many inverter manufacturers have either gone out of business or left the market entirely. Inverter technology has advanced significantly since the early days of PV. In the past, many home and business-scale systems were installed with transformer-based inverters, using grounded arrays. The inverter's integrated transformer provided galvanic isolation between the Medium-Voltage transformer's ground and the array ground. However, with technological advances, the industry has since moved to using transformerless inverters. Transformerless inverters cannot provide the galvanic isolation that is required for a grounded array. With SMA inverters, this would lead to a ground fault error which would prevent feed-in. Therefore, the question remains – how to repower grounded arrays with a transformerless inverter?

The majority of the grounded, legacy PV arrays used negative grounding. Thankfully with most of these negatively grounded systems, grounding was an inverter requirement, not a module/array requirement. Typically, if the PV modules were constructed with PV Wire, they could be used as a "floating" a.k.a. ungrounded array. In such cases, the array could be converted to a floating configuration, which could be used with a transformerless inverter. **These details must be verified with the module manufacturer first, prior to converting from a grounded to a floating array**. Note that the use of floating/ungrounded does not refer to the equipment grounding conductor (EGC), which is still required in floating PV systems, per the NEC.

So, what can be done with positively-grounded arrays or negatively-grounded arrays that cannot be converted to a floating configuration? The first option would be to replace the failed inverter with another transformer-based inverter. The viability of this option will continue decreasing as the years go on, since transformer-based inverters at the home and business scale are no longer widely produced. The only other option would be to add a device between the transformerless inverter and the grounded array that would provide the missing galvanic isolation. SMA does not currently manufacturer such a device unfortunately, however in this ever-evolving market, there are 3rd party options that work with 600 V and 1000 V arrays that will serve this purpose. For further questions regarding repowering legacy arrays, please reach out to your SMA Sales Manager.