**<DRAFT Ideas>**

**Photovoltaic Fault Analysis Experiments**

# Background:

The evaluation of PV fault analysis methodologies for low resolution (maximum power point) and high resolution (I-V curve) includes the emulation of four fault conditions:

1. Soiling
2. Shading
3. Interconnection failure
4. Cell cracks

In preparation for the in-field tests, we intent to generate synthetic data that contains both normal and fault condition data. The synthetic data will be generated by a modeling software (i.e. Python PVLIB) and will include add on functions that will generate the fault conditions. The intent is to create a robust dataset that will allow the team to evaluate the algorithms type 1 and type 2 errors with a statistically significant sample of data.

# Tasks:

The generation of the system model and fault condition functions will be conducted as follows:

1. System Model

The creation of the system model includes the following tasks

Task A1 – Develop Code

Task A2 – Acquire Weather Data from multiple climate zones

Task A3 – Perform model validation

1. Soiling Fault Function

The soiling of PV modules results in:

1. Isc decrease
2. Imp decrease

Task B1 – Analyze historical data to identify the impact caused by soiling (RTC systems)

Task B2 – Perform a literature review to see if soiling models already exist

Task B3 – Create a data-driven function -> f(wind, location, rain, etc.)

Task B4 – Review potential features and/or pre-process for detecting soiling issues

1. Shading Fault Function

Shading creates:

1. Mismatch condition that causes the Imp to decrease

Task C1 -

1. Interconnection Failure Function

Interconnection failures cause:

1. increase the Rsc that causes the Vmp to decrease
2. Cell Crack Function

Cracks in the PV module cells create a mismatch condition

1. Integration of Fault Functions into System Model