**1. Modelling and simulation of the PV Power Plant**

The modelling of the PV Power Plant is taken from the example case developed by RTDS and simulated on RSCAD Fx software. The RSCAD Fx software is simulated on the RTDS NovaCor machine. This model is based on the development of two solar farms that equipped with PV modules connecting to PV inverters. These inverters export power onto a common bus (PVF1Bus2). This bus is connected to a HV transformer that is connected to a second bus (PVF1Bus1) that is connecting the solar farms to a feeder of the power grid. Figure 1 below shows the draft case of the two PV Systems connecting to the common bus PFV1Bus2, the HV Transformer and the PFV1Bus1. The properties of the solar farms are listed in Section 2.2 called PV System 1 and PV System 2.

**2.1. RSCAD Fx Draft of the PV power Plant**

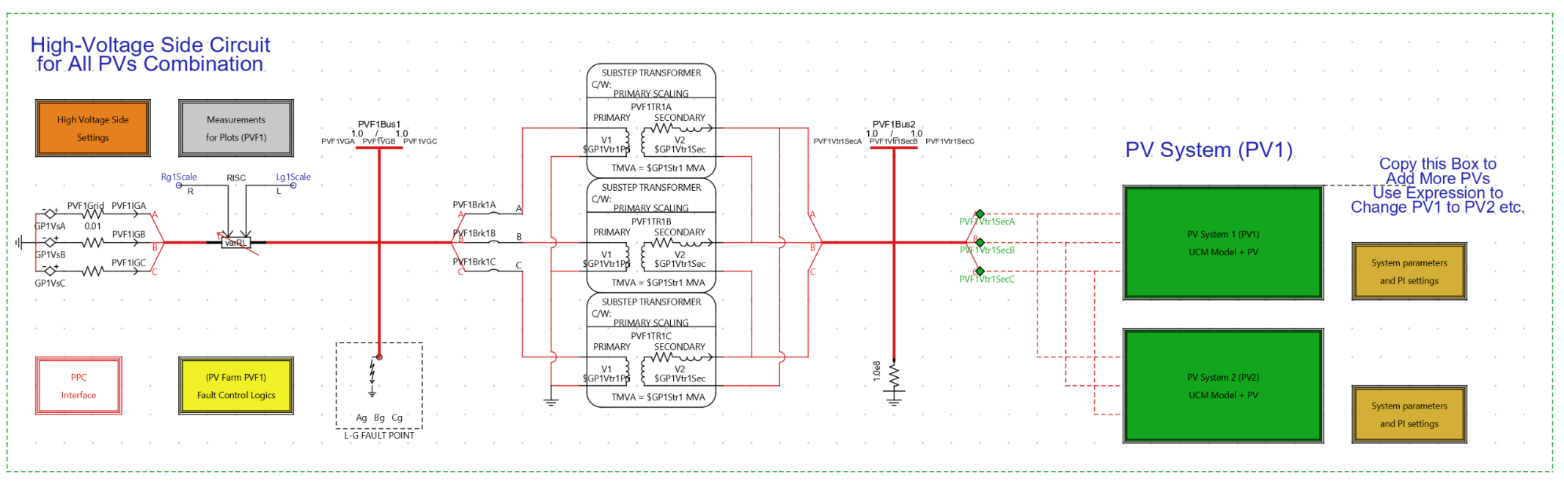


Figure 1: PV Power Plant RSCAD FX Draft Model for Simulation (RTDS: Examples - Power Plant Controller)

**2.2. RSCAD Fx Draft PV System 1 and PV System 2 Diagrams**

A diagram of a computer program

AI-generated content may be incorrect.

Figure 2: RSCAD Fx PV System 1 and PV System 2 Connection Diagram Simplified (RTDS: Examples - Power Plant Controller)

**2.3. RSCAD Fx System Parameters for PV System 1 and PV System 2**

Table 1 below provides the PV system used in modelling in the RSCAD simulation environment.

**Table 1: RSCAD Fx System Parameters for PV System 1 and PV System 2**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **PV System 1** | **PV System 2** |
| **PV Panel Parameters** | | |
| Number of solar cells in series per string in a solar module | 36 | 36 |
| Number of solar strings in parallel in solar module | 4 | 4 |
| Number of solar modules in series in PV panel | 27 | 27 |
| Number of solar modules in parallel in the PV Panel | 153 | 307 |
| Open-circuit voltage of a solar string (Voltage) | 25.2 (V) | 25.2 (V) |
| Voltage at Pmax of a solar string (Voltage) | 20.7407 (V) | 20.7407 (V) |
| Short-circuit current of a solar string (Amperes) | 3.35 (A) | 3.35 (A) |
| Current at Pmax of a solar string (Amperes) | 3.0537 (A) | 3.0537 (A) |
| Standard Temperature for the data (degrees Celsius) | 25 ̊C | 25 ̊C |
| Standard solar insolation for the data (Watts per meter squared) | 1000 W/m2 | 1000 W/m2 |
| **Boost Converter Parameters** | | |
| Boost converter’s switching frequency | 2000 | 2000 |
| Capacitance after PV arrays terminal | 5000 | 1000 |
| DC-bus capacitance for boost converter | 3200 | 62500 |
| Input inductance for boost converter | 0.000250 | 0.000133 |
| **Grid-Side Converter Parameters** | | |
| Grid-side converter’s switching frequency | 2000 | 2000 |
| DC-bus capacitance for grid-side converter | 3200 | 62500 |
| Filter inductance for grid-side converter | 0.000063 | 0.000031 |
| Filter capacitance for grid-side converter | 1500 | 3208 |
| Damping resistor for grid side LC filter | 0.042 | 0.025 |
| **Transformer at Converter Side (D-Y Type)** | | |
| Winding #1 rated voltage (VLL for D windings) | 35 | 35 |
| Winding #2 rated voltage (Vph for Y windings) | 0.18187 | 0.18187 |
| Winding leakage inductance in PU | 0.1 | 0.1 |
| Winding leakage resistance in PU | 0.001 | 0.001 |
| Transformer MVA for 1 phase | 0.3333 | 0.3333 |

**2.4. RSCAD Fx System Parameters for HV Transformer**

Table 2 below provides the High-Voltage Transformer parameter configuration used in the RCSAD-Fx Simulation.

Table 2: HV transformer parameters

|  |  |
| --- | --- |
| **Parameter** | **PV System 1** |
| Grid-side fundamental frequency | 50 |
| Winding #1 rated voltage (Vph for Y windings) | 127.0171 |
| Winding #2 rated voltage (VLL for D windings) | 35 |
| Winding leakage inductance in PU | 0.1 |
| Winding leakage resistance in PU | 0.001 |