**Instructions:**

1. When a determination of conducting a PSCAD study is made by the EDCs, all required technical documentation related to each EDCs along with the deliverables of the PSCAD files as determined in the PSCAD Checklist should be made available to the EDCs prior to starting such study.
2. It is possible to adjust the Settings of the inverter model according to the **Range** column. The **Range** is a general spectrum of allowable settings by the inverter. Such Settings would be required to adhere to the latest IEEE 1547 document.
3. The **Default Required Settings** column shows the required actual setting within the mentioned **Range**. While the PSCAD model should be set as per **Default Required Settings** column, on some circumstances, EDC may require adjusting the settings within the acceptable **Range** column.
4. The manufacturer/developer must fill out the **Corresponding Section in Reference Manual**. This is to affirm that EDC can find the appropriate place in the PSCAD model to set the functions and parameters.

**NOTE:**

The below Table could be modified in the future based on the latest IEEE 1547 Standard requirements. This would impact the **Adjustability of Settings in PSCAD Software** by the EDCs in ensuring that the models are converging to the appropriate IEEE 1547 Standard Settings.

**Table 1. Grid Support Functions**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Function** | **Settings** | **Range** | **Default Required Settings** | **Adjustability of Settings in PSCAD Software** | **Corresponding Section in Reference Manual** |
| Power Factor | Enable/Disable | ON/OFF | Unity power Factor (ON) -Case by Case Otherwise | Yes |  |
| Power Factor | (+/-) 0-1 |
| Frequency Droop (Freq-Watt) | Enable/Disable | ON/OFF | ON | Yes |  |
| Over-frequency Droop Deadband (dbof) | See Table VI in “[Default IEEE 1547-2018 Setting Requirements](https://www.mass.gov/doc/inverter-source-requirements-document/download)” Document or latest version | 0.036 |
| Under-frequency Droop Deadband (dbuf) | 0.036 |
| Under-frequency and Over-frequency Droop (kuf and kof) | 0.05 |
| Open Loop Response Time | 5 |
| Voltage Reactive Power (Volt-Var) | Enable/Disable | ON/OFF | OFF | Yes |  |
| Reference Voltage (Vref) | 0.95-1.05 p.u. |
| Autonomous Vref adjustment | ON/OFF |
| Vref adjustment time constant. Range  | 300 -5000 s |
| V/Q Curve Points  | See Table 8 in “IEEE Std 1547-2018” Document or latest version |
| Open Loop Response Time | 1-90 s |
| Active Power- Reactive Power (Watt-Var) | Enable/Disable  | ON/OFF | OFF | Yes |  |
| P/Q Curve Points | See Table 9 in “IEEE Std 1547-2018” Document or latest version |
| Constant Reactive Power (Var) | Enable/Disable  | ON/OFF | OFF | Yes |  |
| Constant reactive power settings | See Table 7 in “IEEE Std 1547-2018” Document or latest version |
| Voltage-Active Power (Volt-Watt) | Enable/Disable | ON/OFF | OFF | Yes |  |
| V/P Curve Points | See Table 10 in “IEEE Std 1547-2018” Document or latest version |
| Open Loop Response Time | 0.5-90 s |

**Table 2. Voltage/Frequency Trip and Mode of Operation Parameters**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Settings** | **Range** | **Default Required Settings** | **Adjustability of Settings in PSCAD Software** | **Corresponding Section in reference manual** |
| High voltage shall trip curve points |  | See Table IV in “[Default IEEE 1547-2018 Setting Requirements](https://www.mass.gov/doc/inverter-source-requirements-document/download)” Document or latest version | OV2 Setting:V: 1.2 puTrip: 0.16s | No |  |
| OV1 Setting:V: 1.1 puTrip: 2.0s | No |
| Low voltage shall trip curve points |  | See Table IV in “[Default IEEE 1547-2018 Setting Requirements](https://www.mass.gov/doc/inverter-source-requirements-document/download)” Document or latest version | UV2 Setting:V: 0.5puTrip: 1.1s | No |  |
| UV1 Setting:V: 0.88puTrip: 3.0s | No |
| HV Mode of Operation[[1]](#footnote-1) | Cease to Energize | See Table V in “[Default IEEE 1547-2018 Setting Requirements](https://www.mass.gov/doc/inverter-source-requirements-document/download)” Document or latest version | V > 1.20pu | No |  |
| Momentary Cessation | 1.10pu < V ≤ 1.20pu | No |
| Normal Mode of Operation | Continuous Operation | See Table V in “[Default IEEE 1547-2018 Setting Requirements](https://www.mass.gov/doc/inverter-source-requirements-document/download)” Document or latest version | 0.88pu ≤ V≤ 1.10pu | No |  |
| LV Mode of Operation | Mandatory Operation | See Table V in “[Default IEEE 1547-2018 Setting Requirements](https://www.mass.gov/doc/inverter-source-requirements-document/download)” Document or latest version | 0.50pu ≤ V < 0.88pu | No |  |
| Momentary Cessation | V < 0.5pu | No |
| High frequency shall trip curve points |  | See Table I in “[Default IEEE 1547-2018 Setting Requirements](https://www.mass.gov/doc/inverter-source-requirements-document/download)” Document or latest version | OF2 Setting: Freq: 62.0HzTrip:0.16s | No |  |
| OF1 Setting: Freq: 61.2HzTrip:300s | No |
| Low Frequency shall trip curve points |  | See Table I in “[Default IEEE 1547-2018 Setting Requirements](https://www.mass.gov/doc/inverter-source-requirements-document/download)” Document or latest version | UF2 Setting: Freq: 56.5HzTrip: 0.16s  | No |  |
| UF1 Setting: Freq: 58.5HzTrip: 300s  | No |
| HF Mode of Operation | Mandatory Operation | See Table II in “[Default IEEE 1547-2018 Setting Requirements](https://www.mass.gov/doc/inverter-source-requirements-document/download)” Document or latest version | 61.2Hz < f ≤ 61.8Hz | No |  |
| Normal Mode of Operation | Continuous Operation | See Table II in “[Default IEEE 1547-2018 Setting Requirements](https://www.mass.gov/doc/inverter-source-requirements-document/download)” Document or latest version | 58.8Hz ≤ f ≤ 61.2Hz | No |  |
| LF Mode of Operation | Mandatory Operation | See Table II in “[Default IEEE 1547-2018 Setting Requirements](https://www.mass.gov/doc/inverter-source-requirements-document/download)” Document or latest version | 57.0Hz ≤ f < 58.8Hz | No |  |
| RoCoF | Enable/Disable | ON/OFF | ON/OFF | No |  |
| 3 Hz/s | 0.5-3 Hz/s | > 3 Hz/s[[2]](#footnote-2) | No[[3]](#footnote-3) |
| Phase Jump |  | See Section 6.5.2.6 in “IEEE Std 1547-2018” Document or latest version | **Positive sequence phase angle:** Multi-phase DER shall ride through for changes within a sub-cycle-to-cycle time frame of the applicable voltage ≤ 20 degrees | No3 |  |
| **Individual phase angle:** Multi-phase DER shall remain in operation for changes in the phases angle of individual phases < 60 degrees | No3 |
| Momentary High Voltage Trip | Self-Protection Over Voltage (SPOV) Function | V: 1.2-1.4 puTrip: 1-5 ms | V: 1.4puTrip: 1ms -Case by Case Otherwise | Yes |  |

**By submitting the checklist, the inverter supplier certifying that the hardware can be programmed to match the model.**

|  |
| --- |
| **If the manufacturer/developer has any other general comments, they should mention them below:** |
|  |

1. These modes of operation may not be adjustable. [↑](#footnote-ref-1)
2. If RoCoF setting is enabled, otherwise not required. [↑](#footnote-ref-2)
3. As tested in the UL1741-SB Edition 3 Certificate or latest. [↑](#footnote-ref-3)