Advanced Inverter Function (AIF) Setting FAQs

What are Advanced Inverter Function (AIF) settings?

Advanced Inverter Function (AIF) settings can be used in place of the default inverter settings. Inverter systems come with preset settings approved by local regulations, however; they can be manually customized to meet utility requirements. Specifically, we are referring to the inverter system's programmed Volt-VAR and optional Volt-Watt setpoints.

Why are these inverter settings critical?

Inverter settings control the output flowing back to SMUD's electrical grid from generation systems and allow customers to safely interconnect to SMUD's system without overloading it.

How do I set/change my inverter settings?

Many residential customers work through a PV solar providing company to set or change their inverter settings. In that case, the installer or company typically manages inverter settings at installation or commissioning and may provide ongoing service after installation.

SMUD typically communicates with the installer during the application process and includes the customer in communications. Other customers might choose to install and/or manage their own inverter settings.

Inverter settings are typically accessed through a settings input screen directly on the device. Many inverters now also have mobile or web applications that allow installers or owners to change settings remotely.

See table below for examples of some inverter manufacturer resources.

When are AIF settings required?

All residential solar or generation projects with an inverter will be assessed for AIF settings during the application process. AIF settings including Volt-VAR and optional Volt-Watt setpoints, if required, will be communicated to the customer, installer, and other application stakeholders during the project approval phase, within the approval to build letter.

How do AIF Settings affect system output?

In many cases, adhering to AIF settings will not have an impact on your system output or cost-savings. AIF settings could be Standard AIF settings which are at times referred to as Rule 21 settings by some California utilities, , or they may be Custom AIF settings, or they may be Unity Power Factor (PF) (no AIF settings) which is even less restrictive than Rule 21 Volt-VAR setpoints.

With Standard AIF and Custom AIF settings we require that the inverter system be programmed with the appropriate Volt-VAR & optional Volt-Watt setpoints to comply with SMUD's required AIF settings and proof of this be submitted to SMUD.

What AIF information is required for project approval?

Each project's specific AIF settings will be included in the approval to build email, if required. Inverters must be configured to comply with the project's AIF settings requirements and verification must be provided to confirm compliance.

There are three settings outcomes: No AIF settings or Unity PF, Standard AIF settings, or Custom AIF settings. If no AIF settings are required, the inverter(s) can use any settings and no verification is needed (the email will not list any AIF information). If specific AIF settings are required, such as Standard AIF or Custom AIF settings, verification must be provided to show that the system has been updated with the appropriate Volt-VAR & optional Volt-Watt setpoints to comply with SMUD's required AIF settings.

How to verify AIF settings?

If your project's approval to build letter requires AIF settings, you must submit a picture(s) of the inverter AIF (Volt-Watt and Volt-VAr) setpoints to your PowerClerk Interconnection application to verify setpoints match the approval to build for the specific project location.

Acceptable picture(s) proof includes the inverter settings screenshots showing Volt-VAR setpoints, As-Left settings sheet/screenshot, or a web/mobile application printout/screenshot, etc. Manufacturer specification sheets are not acceptable verification as they do not verify inverter setpoints As-Left on a specific project. Some manufacturers may provide a way to produce a Grid Compliance or Utility Compliance report. Please contact the manufacturer for specific details on how to obtain this information.

SMUD may accept screenshots showing system, utility or grid profile or country code selection with accompanying manufacturer documentation listing the associated Volt-VAR and Volt-Watt setpoints.

Micro-inverters can show the overall system Volt-VAR setpoints which may be accessed from a gateway, envoy, or master controller type device or from a web or mobile application. Please contact the inverter manufacturer directly for instructions on how to obtain this information for your specific system.

We have provided examples at the end of this document of how some of the inverter manufacturer's provide resources for obtaining this information. These are merely examples meant for general reference and guidance. Please contact the manufacturer directly to get specific instructions on accessing and providing system's programmed Volt-VAR and Volt-Watt setpoints.

How to read AIF settings on an Inverter:

AIF settings Volt-VAR Setpoints fields:
VAR PRIORITY (Active power curtail) Nominal
Voltage Setting (Volt)
Voltage Setting P0 /UnitVolt: Optional
Voltage Setting P1 /UnitVolt: Voltage per unit setting 1, this is per unit value of nominal volage (V1 Paired with Q1 in 4-point Volt-VAR curve)
Voltage Setting P2 /UnitVolt: Voltage per unit setting 2, this is per unit value of nominal volage (V2 Paired with Q2 in 4-point Volt-VAR curve)
Voltage Setting P3 /UnitVolt: Voltage per unit setting 3, this is per unit value of nominal volage (V3 Paired with Q3 in 4-point Volt-VAR curve)
Voltage Setting P4 /UnitVolt: Voltage per unit setting 4, this is per unit value of nominal volage (V4 Paired with Q4 in 4-point Volt-VAR curve)
Voltage Setting P5 /UnitVolt: Optional
VAR Cap.Set0 as %inv. capacity: Optional
VAR Cap.Set1 as %inv. Capacity: VAR Capacity setting 1, this is a per unit value of inverter capacity (Q1 paired with V1 in 4-point Volt-VAR curve)
VAR Cap.Set2 as %inv. Capacity: VAR Capacity setting 2, this is a per unit value of inverter capacity (Q2 paired with V2 in 4-point Volt-VAR curve)
VAR Cap.Set3 as %inv. capacity: VAR Capacity setting 3, this is a per unit value of inverter capacity (Q3 paired with V3 in 4-point Volt-VAR curve)
VAR Cap.Set4 as %inv. capacity: VAR Capacity setting 4, this is a per unit value of inverter capacity (Q4 paired with V4 in 4-point Volt-VAR curve)
VAR Cap.Set5 as %inv. capacity: Optional

Optional fields:
PV_V1_VOLT_WATT: Voltage per unit setting 1, this is per unit value of nominal voltage (V1 paired with Q1 in 2-point Volt-Watt curve)
PV_P1_VOLT_WAT: Active Power per unit setting 1, this is per unit value of inverter capacity (P1 paired with V1 in 2-point Volt-Watt curve)
PV_V2_VOLT_WATT: Voltage per unit setting 2, this is per unit value of nominal voltage (V2 paired with Q2 in 2-point Volt-Watt curve)
PV_P2_VOLT_WATT: Active Power per unit setting 2, this is per unit value of inverter capacity (P2 paired with V2 in 2-point Volt-Watt curve)

AIF Resources by Manufacturer:

The table below includes common inverter manufacturer's settings resources as examples for general reference and guidance. **If an inverter system manufacturer is not listed, please contact the manufacturer directly to get specific instructions on accessing Volt-VAR setpoints.** Manufacturers not listed can send how-to links for obtaining AIF settings proof to Solar.PV@smud.org. SMUD will update the FAQ for future reference.

Manufacturer	Link to Settings Information	Link to Settings Video
SolarEdge	https://www.solaredge.com/sites/default/files/se_instruction_california_electric_rule_21_upgrade_instructions.pdf	
Enphase	https://www4.enphase.com/en-us/ca-rule-21?_ga=2.228750554.753543576.1617182450-621380834.1616405689%3F_ga%3D2.228750554.753543576.1617182450-621380834.1616405689	https://support.enphase.com/s/article/How-to-select-a-grid-profile-using-Installer-Toolkit
SMA	https://files.sma.de/downloads/SBxx-1XP-US-41-GridServices-TI-en-10.pdf	https://www.youtube.com/watch?v=zp4sXskafKo
Sungrow	https://service.sungrowpower.com.au/files/Web_Files/FAQ/GD_201911_All_Volt%20Response%20Mode%20Settings%20for%20Sungrow%20residential%20inverters_V1.1.pdf	https://www.youtube.com/watch?v=96rKJAqfhzE&feature=youtu.be

Note: Micro-inverters do not need to be set individually to comply with AIF settings Volt-VAR setpoints; however, the system as a whole must comply with the SMUD directed AIF settings Volt-VAR setpoints. Micro-inverter overall system settings may be accessed from a gateway, envoy, or master controller type device or from a web or mobile application, please contact the manufacturer directly to get specific instructions.