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V2.1

On/Off-grid Paralleling & Diesel Generator Solutions For VHT25-50K

www.veichi.cn



V1.0
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1 Introduction

2 Strategies

3 Solution Wiring

4 Configuration

5 Case Study

6 Q&A

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01
Introduction

Brief Introduction of On/Off-grid Paralleling and DG Solutions

Veichi On/Off-grid paralleling Solution

Veichi **VHT25-50K** hybrid inverter supports up to **4 units On/Off-grid** side parallel which can reach **200kW**. It is perfect for high-power needs in factories, malls or parks, ensuring continuous power supply even when the grid is absent or unstable. Plus, its **7 work modes** (including ToU) let you optimize energy use, saving costs and boosting profits!

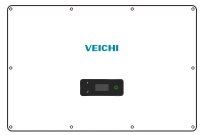
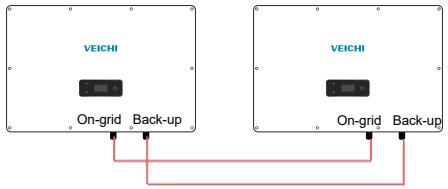
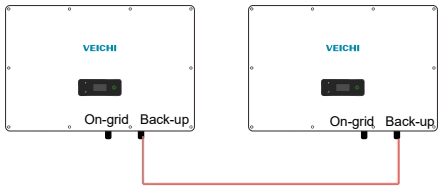
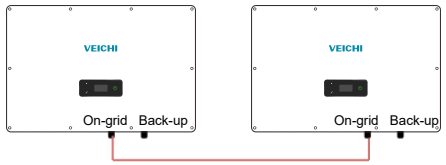
Veichi offers not only single-inverter DG solutions but also multi-inverter DG solutions with the EDA backup box and ATS. These solutions cover a wide range of applications from residential to commercial, providing intelligent and efficient management of your entire energy system.

Veichi DG Solutions

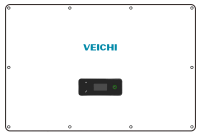
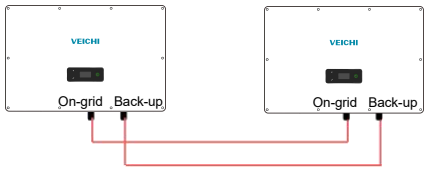
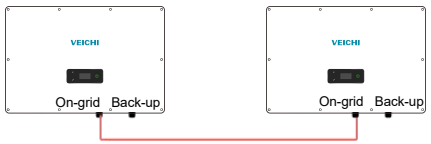
Veichi diesel generator solutions are designed to provide a reliable and instant power supply to customers living in unstable power grid areas. It introduces another power source to ensure energy security when the power grid experiences outages, whether by accident or as informed in advance.

In our DG solution, the diesel generator can not only power the loads but also charge the battery when the grid fails, enhancing system stability. **It's important to note that the DG and inverter don't supply loads at the same time, so make sure each of their outputs exceed your load needs.**

Definition and Scenarios for Parallel

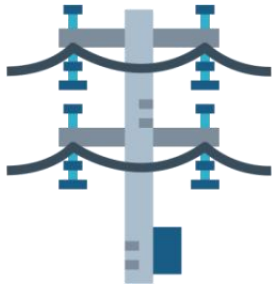
Type	Physical Connection	Rated Output Power	Definition	Application scenarios
Single		25-50kW	Operate with single inverter	**With battery-backup function.** Suitable for grid-connected, off-grid, or scenarios requiring on/off-grid switching due to frequent power outages.
Parallel	**On/Off-grid parallel** 	50-200kW	Operate with up to four inverters connected in parallel on both the on-grid side and the backup side.	**With system-level battery-backup function.** **Scenarios**: Suitable for place which has frequent power outages. **Benefit**: Reduce reliance on the power grid, and continue to operate with loads even when the grid is down.
	Off-grid parallel 		Operate with up to four inverters connected in parallel on the back-up side.	**Scenarios:** Suitable only for off-grid locations. **Benefit**: Build a microgrid system, and power the system using PV and batteries.
	On-grid parallel 	50-500kW	Operate with up to ten inverters connected in parallel on the on-grid side.	**Without system-level battery-backup function.** **Scenarios:** Suitable for stable grid-connected locations. **Benefit**: Reduce electricity costs, or achieve peak-valley arbitrage, or respond to grid dispatch.

Solution List with Different AC Source

Type	Physical Connection	Solution List	Page
Single		Single Inverter DG Solutions/**With Grid (GEN Port)**	**P12**
Parallel	**On/Off grid parallel** 	Off-grid Parallel Solutions/**Scenario1 With Grid**	**P13**
		Off-grid Parallel Solutions/**Scenario2 With DG**	**P14**
		Off-grid Parallel Solutions/**Scenario3 With Grid & DG**	**P15**
		Off-grid Parallel Solutions/**Scenario4 Without Grid & DG**	**P16**
	On-grid parallel 	On-grid Parallel Solutions/**With Grid & DG**	**P17**

Devices Requirement










Purchase Channel		From Veichi	/	From Market	From Veichi	From Market	Together with Inverter	/
Solution Type	**DG Access Point**	**Support Models**	**Grid Conditions**	**Diesel Generator**	**EDA**	**ATS**	**Smart Meter**	**Firmware Version**
Single-unit	GEN	VHT25-50K From Nov 2024	On-grid/Off-grid	Three-phase DG With DI Control	/	/	RMM	ARM≧03(15) DSP≧03(23)
Off-grid parallel (Back-up side)	GRID	VHT25-50K From 2024	Off-grid		Yes	/		ARM≧05 DSP≧05
	ATS		On-grid		Yes	Yes		
On-grid parallel	ATS		On-grid		/	Yes		ARM≧05 DSP≧05*

*7 work modes available when the firmware version higher than V05.05.**.**-V**.**.**.** ; otherwise, only general mode available.

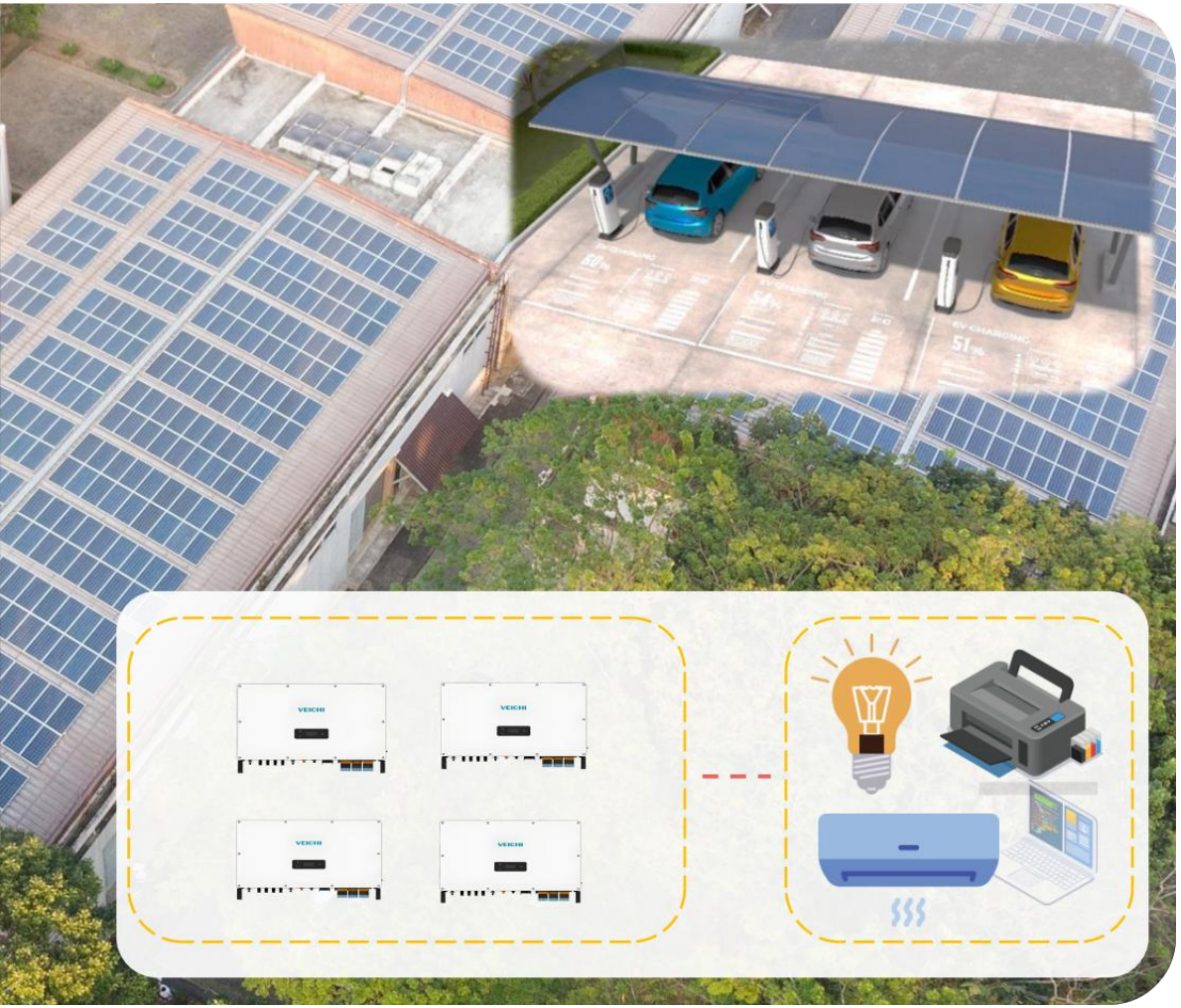
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02

Strategies

Logic for Off-grid Paralleling Solutions



Master and slave control

- Up to 4 inverters off-grid parallel is supported
- One master inverter controls scheduling and settings, which are synced to other slave inverters.
- The master inverter evenly distributes the power of each phase of the slave inverters based on the three-phase load conditions.

Work modes

- With grid, 7 work modes can be selected same as the single inverter. If the grid is lost, the system switches to off-grid mode automatically.

Rated Power

- All parallel inverters must be same power and model
- $P_{Total} = N \times P_{Single}$, (N means the quantity of paralleled inverter, N≤4)

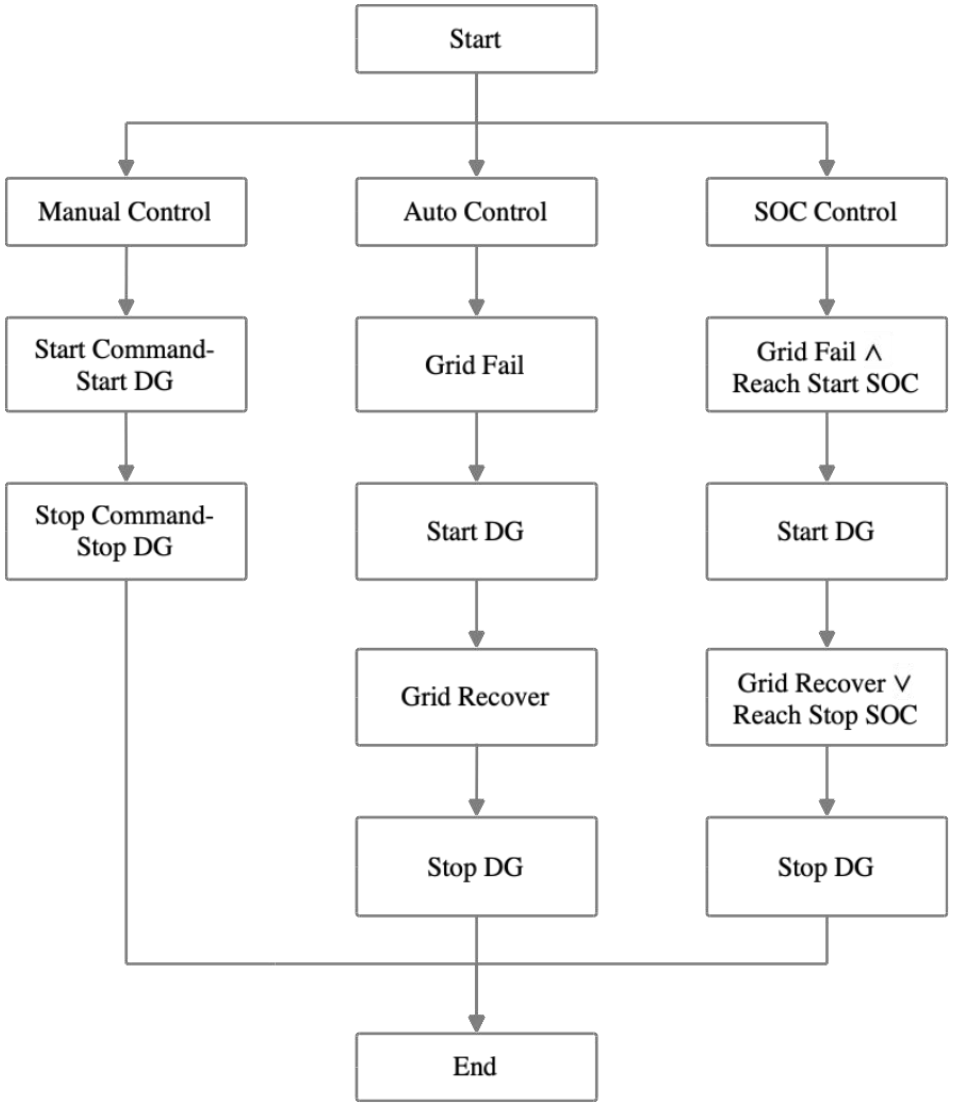
Operation

- If a slave inverter fails or triggers protection, the master isolates it, and the system keeps running.
- If the master fails, the whole system shuts down.
- Slave's battery failure: system keeps running and treat it as no battery.
- Master's battery failure: system runs only when master has PV power.

Control Methods & Logic for DG Solutions

DG Output Modes	Description
Loads Only	The diesel generator will only power the loads when required.
Loads and Battery	The diesel generator will power the loads first and charge the battery if there's excess power. Charging Power=DG Max Output Power-Load Power

DG Control Methods	Description
Manual Control	Manually turn On and Off DG through the App. Suggest to use while first commissioning.
Automatic Control	DG auto turns On when the grid fails, and DG auto turns Off when the grid recovers. This method is not working when DG directly connected to inverter grid port.
SOC Control	When the grid fails, the system will use the battery to supply the loads first and use DG when the battery SOC is lower than the preset value. DG will stop when the grid recovers or SOC reaches the preset value.



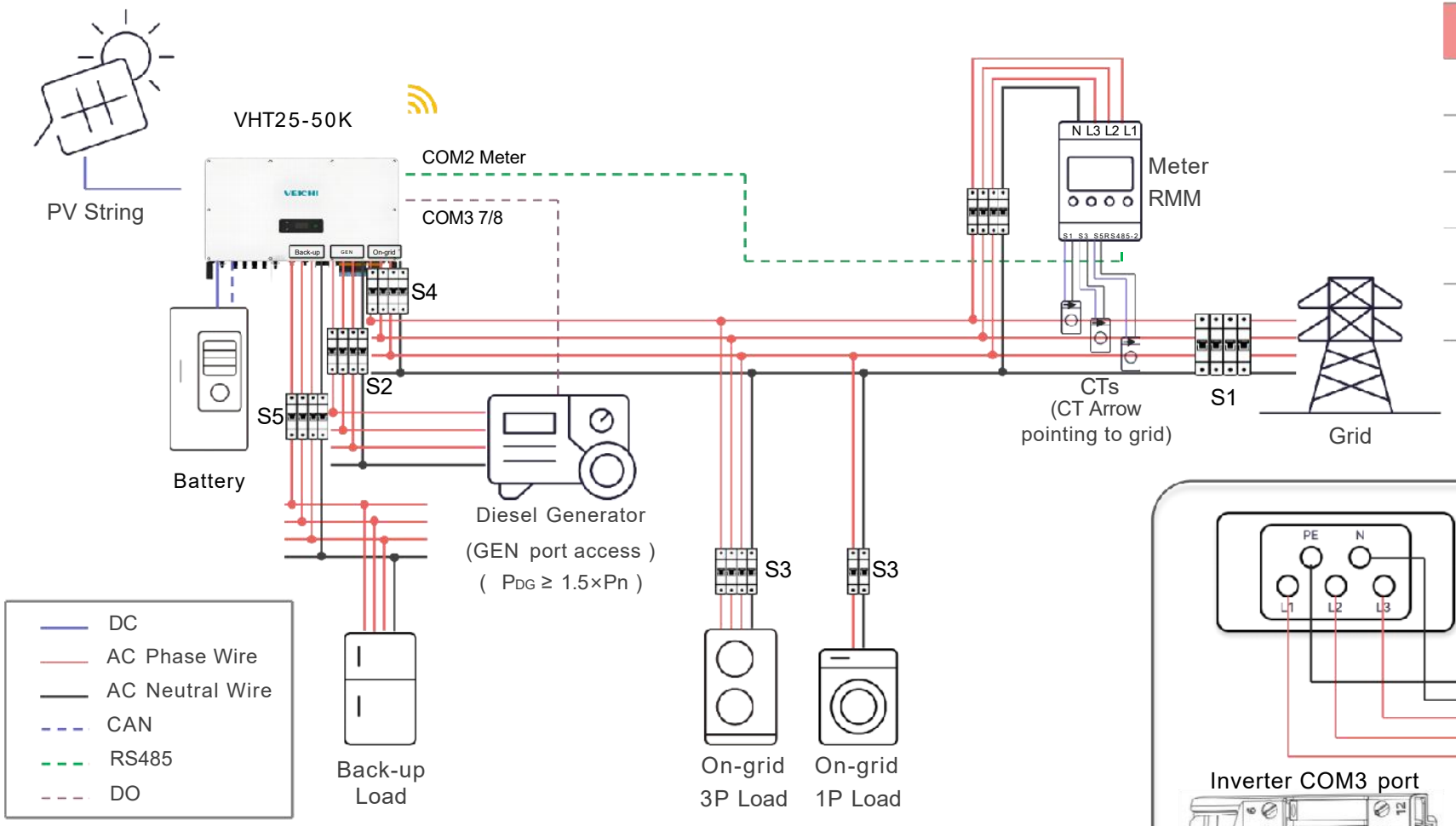
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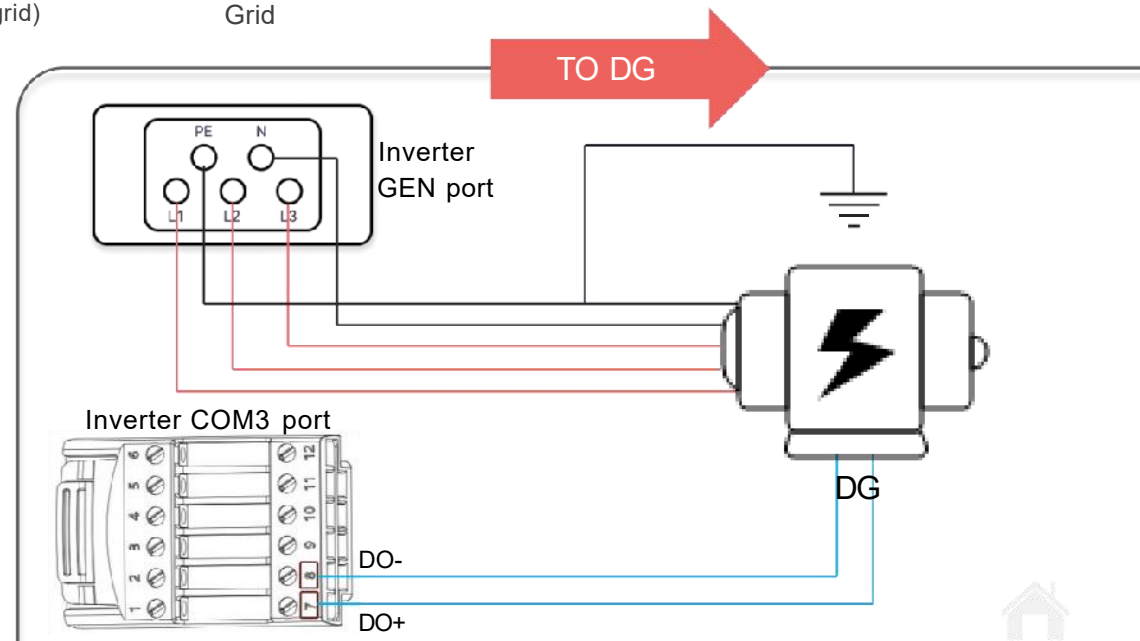
03

Solution Wiring

Single Inverter DG Solutions/with Grid (GEN Port)



Breaker	Function
S1	Grid side breaker
S2	Generator breaker
S3	On-grid load breaker
S4	On-grid output breaker
S5	Back-up load breaker

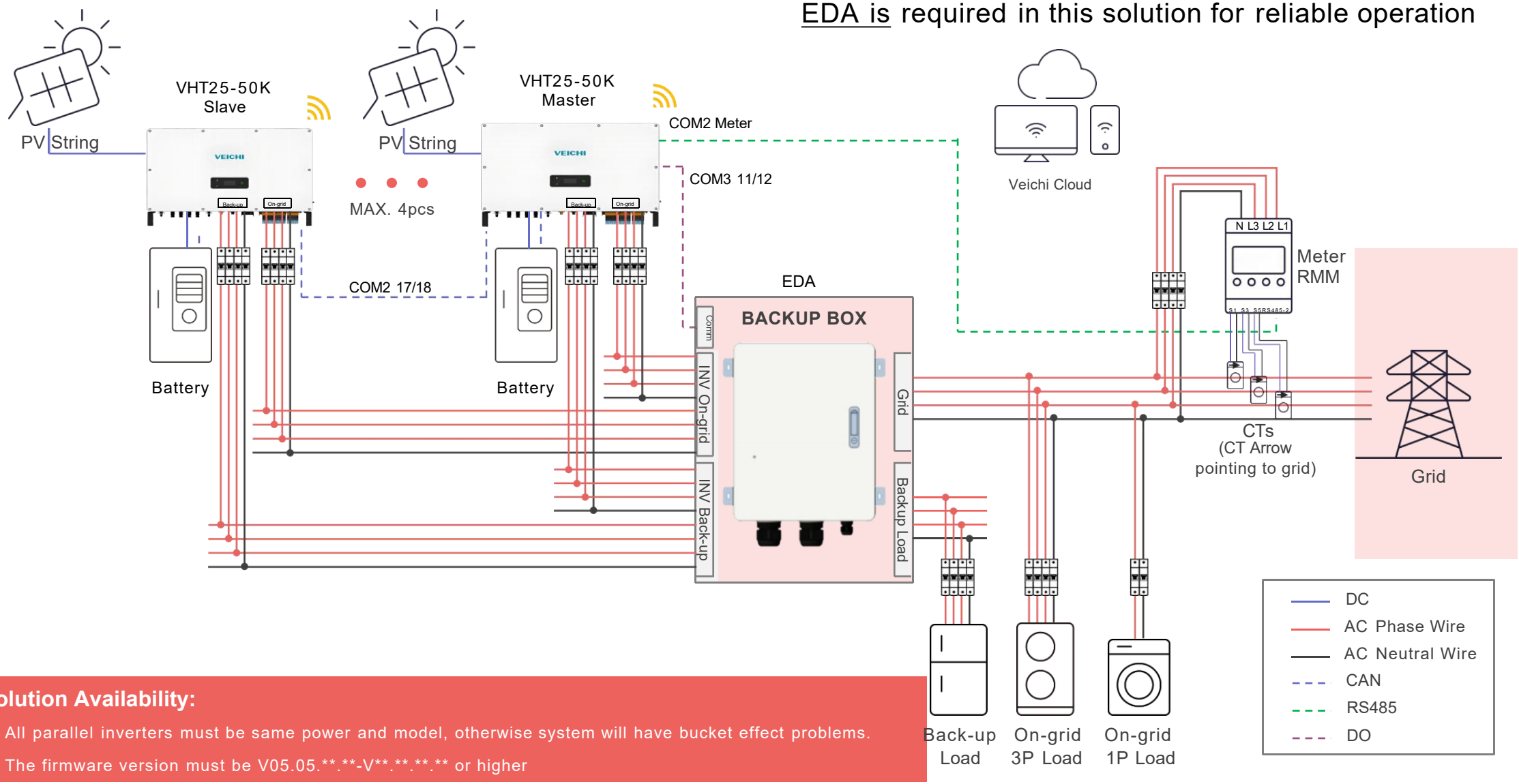


Solution Availability:

- VHT25-50K inverter produced from Nov. 2024 is available for this DG solution.
- DG solution for earlier produced inverter please consult the service team.

Off-grid Parallel Solutions/Scenario1 with Grid

EDA is required in this solution for reliable operation

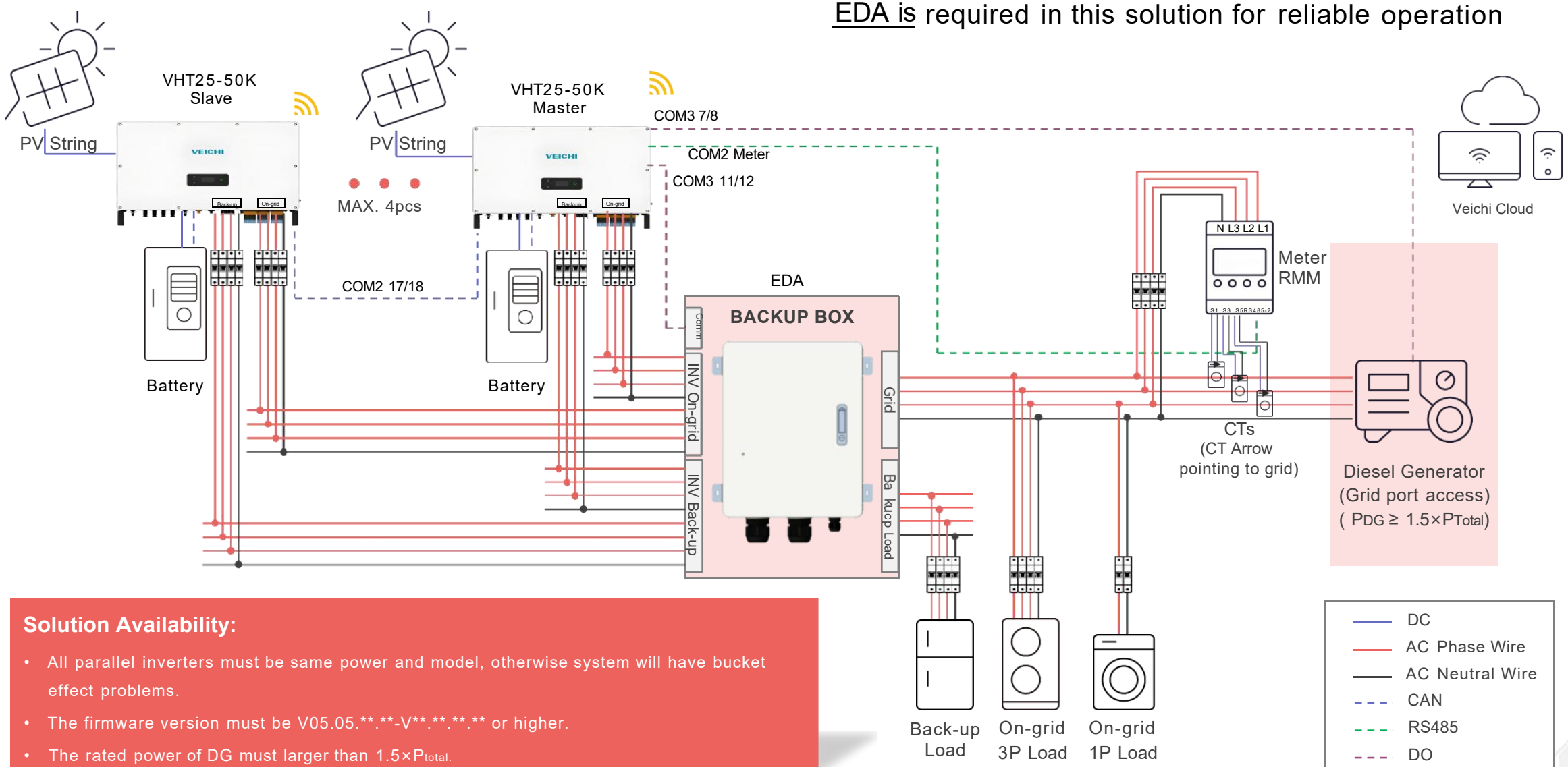


Solution Availability:

- All parallel inverters must be same power and model, otherwise system will have bucket effect problems.
- The firmware version must be V05.05.**.**-V**.**.**.** or higher

Off-grid Parallel Solutions/Scenario2 with DG

EDA is required in this solution for reliable operation

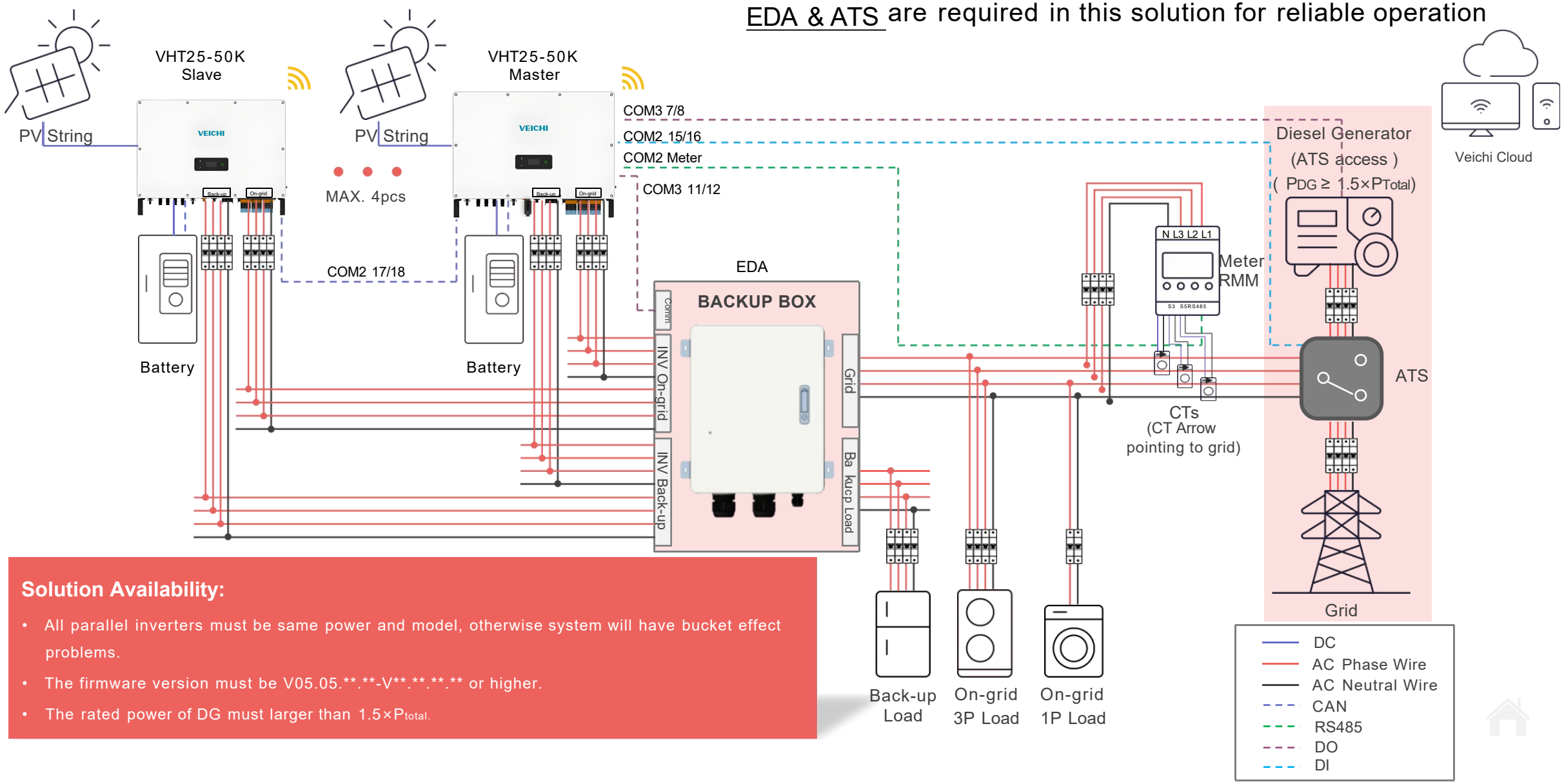


Solution Availability:

- All parallel inverters must be same power and model, otherwise system will have bucket effect problems.
- The firmware version must be V05.05.**.**-V**.**.**.** or higher.
- The rated power of DG must larger than 1.5×P_{total}.

Off-grid Parallel Solutions/Scenario3 with Grid & DG

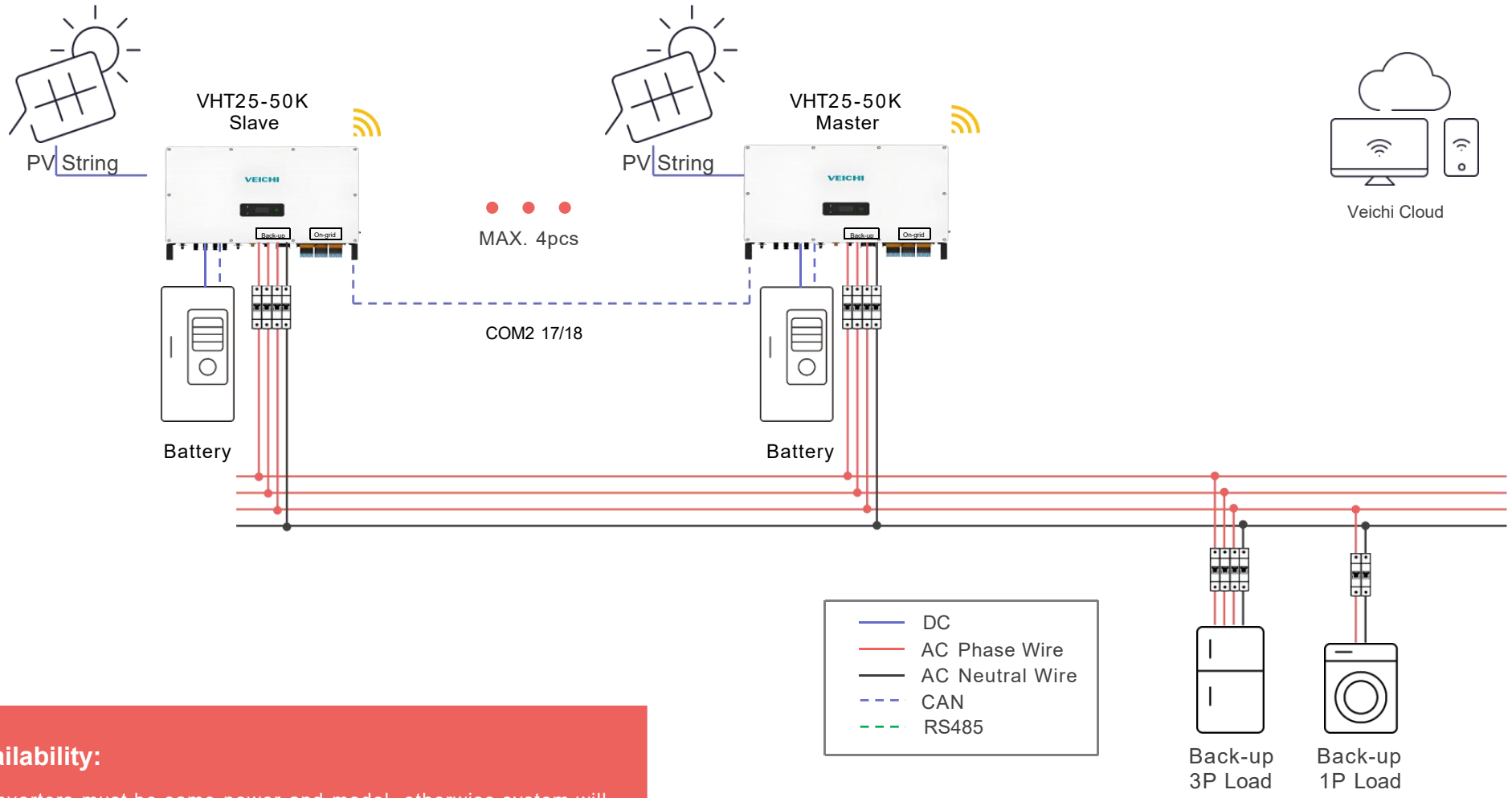
EDA & ATS are required in this solution for reliable operation



Solution Availability:

- All parallel inverters must be same power and model, otherwise system will have bucket effect problems.
- The firmware version must be V05.05.**.**-V**.**.**.** or higher.
- The rated power of DG must larger than 1.5×P_{total}.

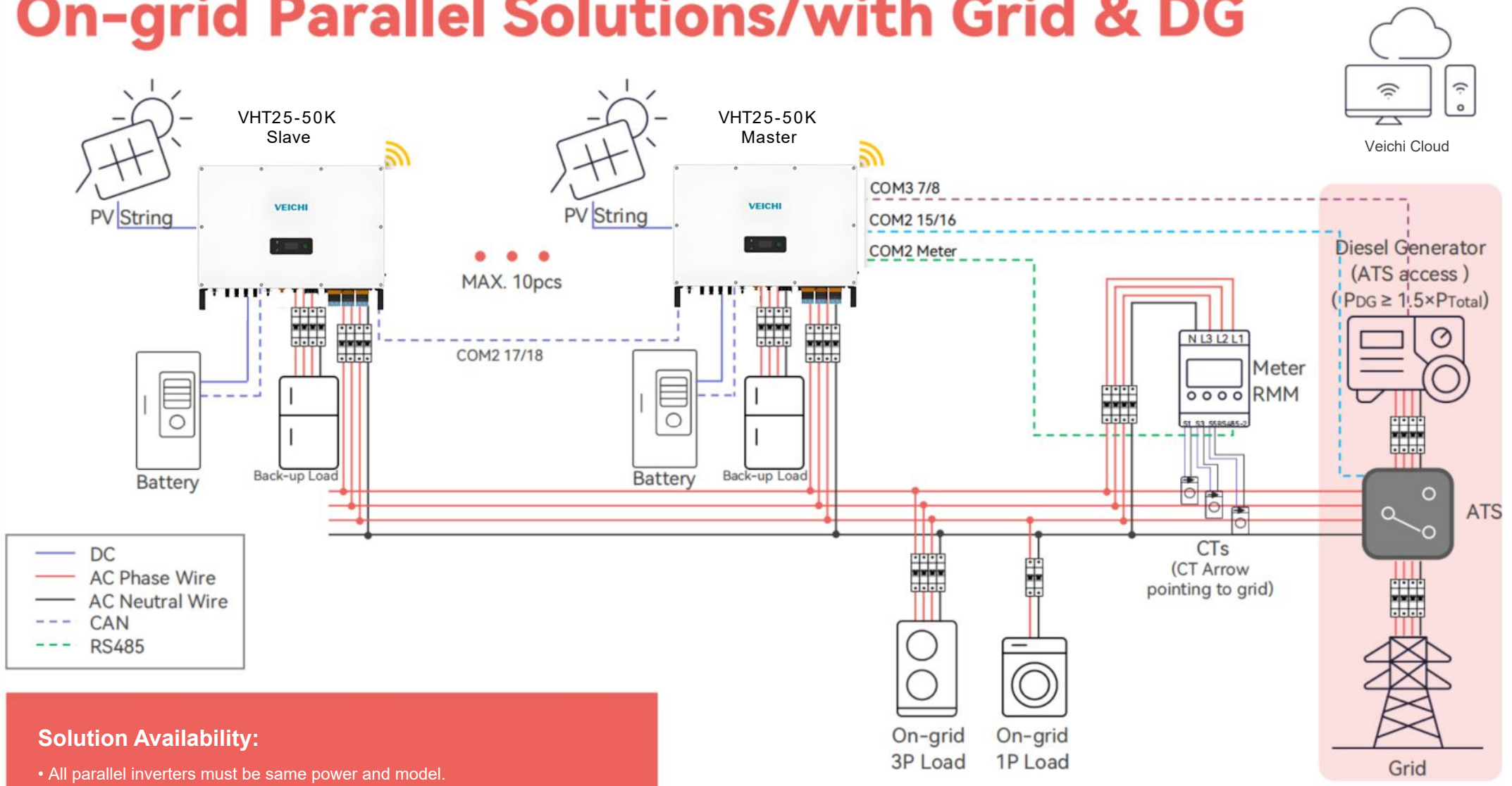
Off-grid Parallel Solutions/Scenario4 without Grid & DG



Solution Availability:

- All parallel inverters must be same power and model, otherwise system will have bucket effect problems.
- The firmware version must be V05.05.**.**-V**.38.**.** or higher.

On-grid Parallel Solutions/with Grid & DG

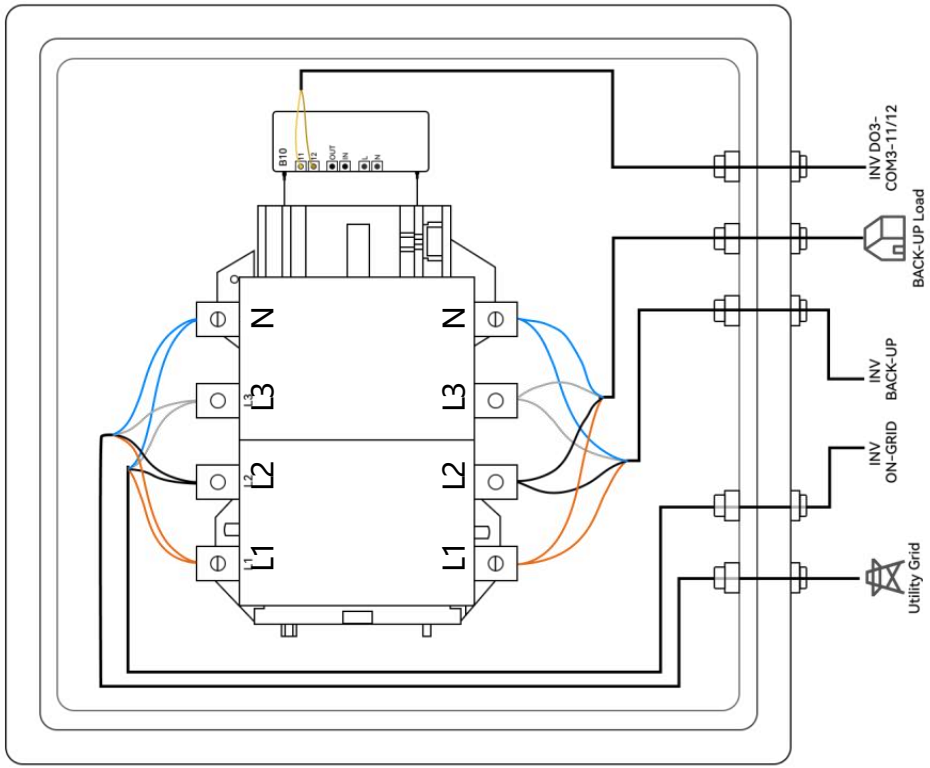


Solution Availability:

- All parallel inverters must be same power and model.
- 7 work modes available when the firmware version higher than V05.05.**.**-V**.**.**.** ; otherwise, only general mode available.

EDA and ATS Wiring Introduction

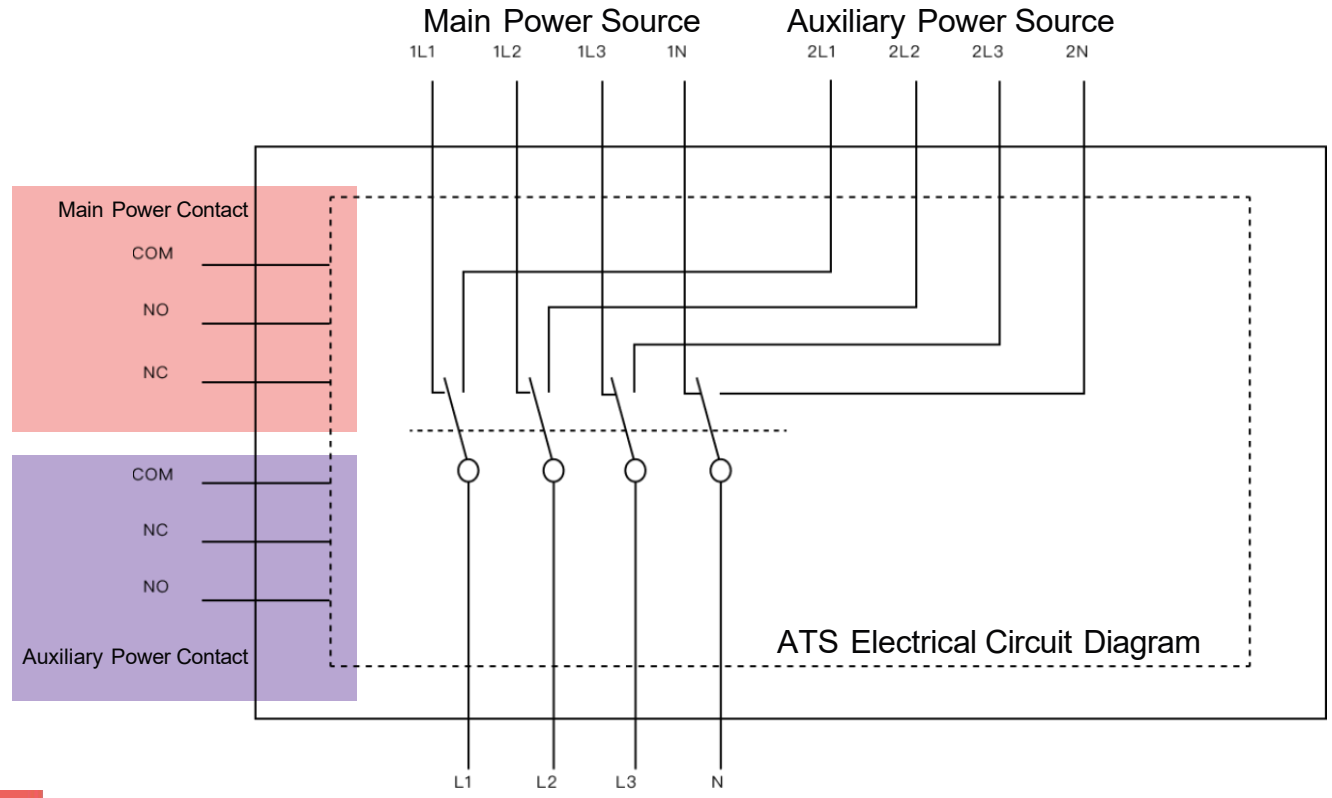
EDA Back-up Box Circuit



EDA(Back-up Box):

EDA is a controller developed by Veichi to facilitate seamless switchover between on-grid and off-grid parallel applications, ensuring steady operation and enhancing the overall reliability and resilience of the hybrid energy system.

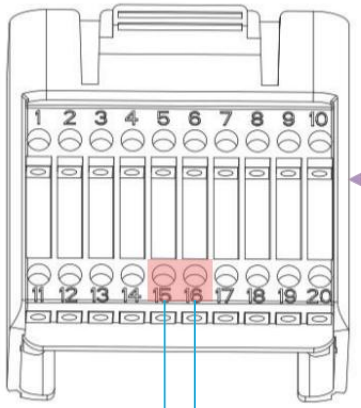
ATS



Device	To Inverter Com	Device	To Inverter Com
DG	COM3 7/8	EDA	COM3 11/12
ATS	COM2 15/16		

EDA and ATS Communication Wiring

COM2



Function: The inverter needs to connect with the ATS signal to determine whether the grid or the DG is supplying power.

TO ATS

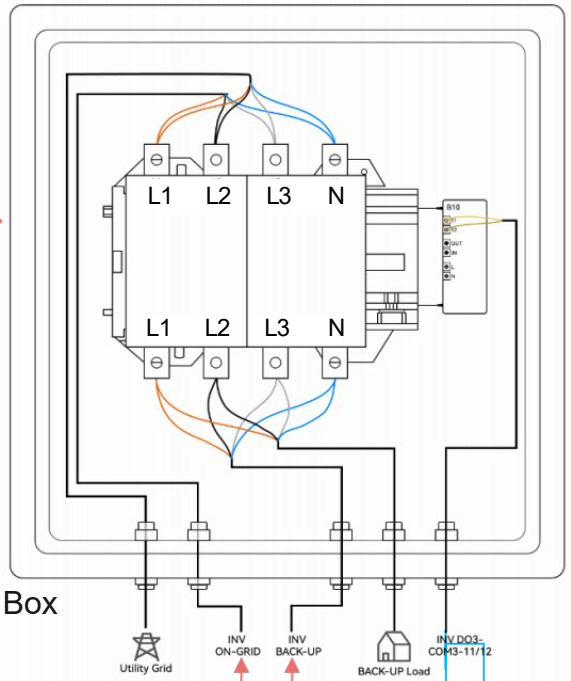
Principle for P15 & P16 signal:

- Detect an open state, it is identified as the power grid.
- Detect a closed state, it is identified as the DG.



VHT25-50K

TO EDA



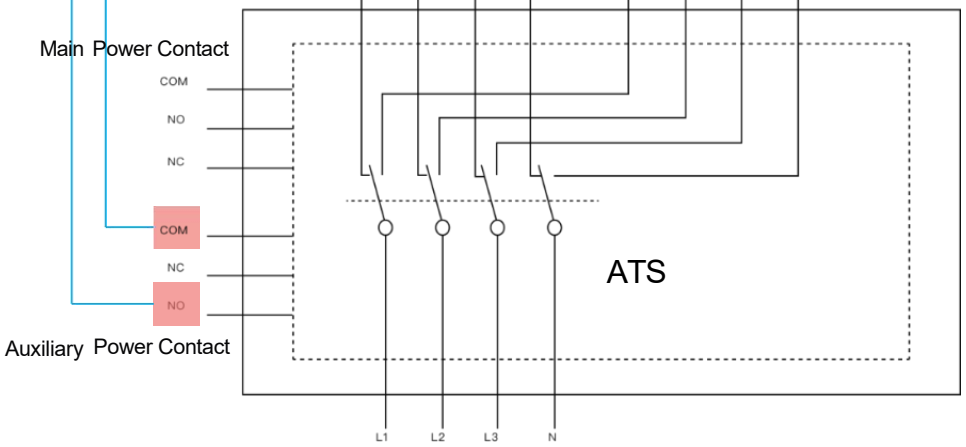
EDA
Back-up Box

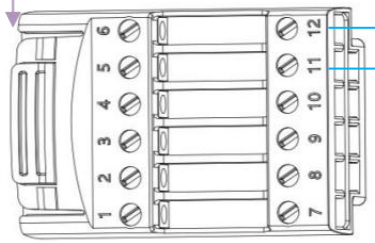
To Grid

To Generator

Main Power Source
1L1 1L2 1L3 1N

Auxiliary Power Source
2L1 2L2 2L3 2N





COM3

12→12

11→11

Notice While Using Off-grid Paralleling Solution

INVERTERS

- **Quantity**: Up to 4 inverters Off-grid parallel is supported.
- **Model**: All parallel inverters must be same power and model

PV & BATTERY

- **Capacity**: The PV strings and battery capacities connected to each inverter needs to be equal or basically equal.

OTHER DEVICES

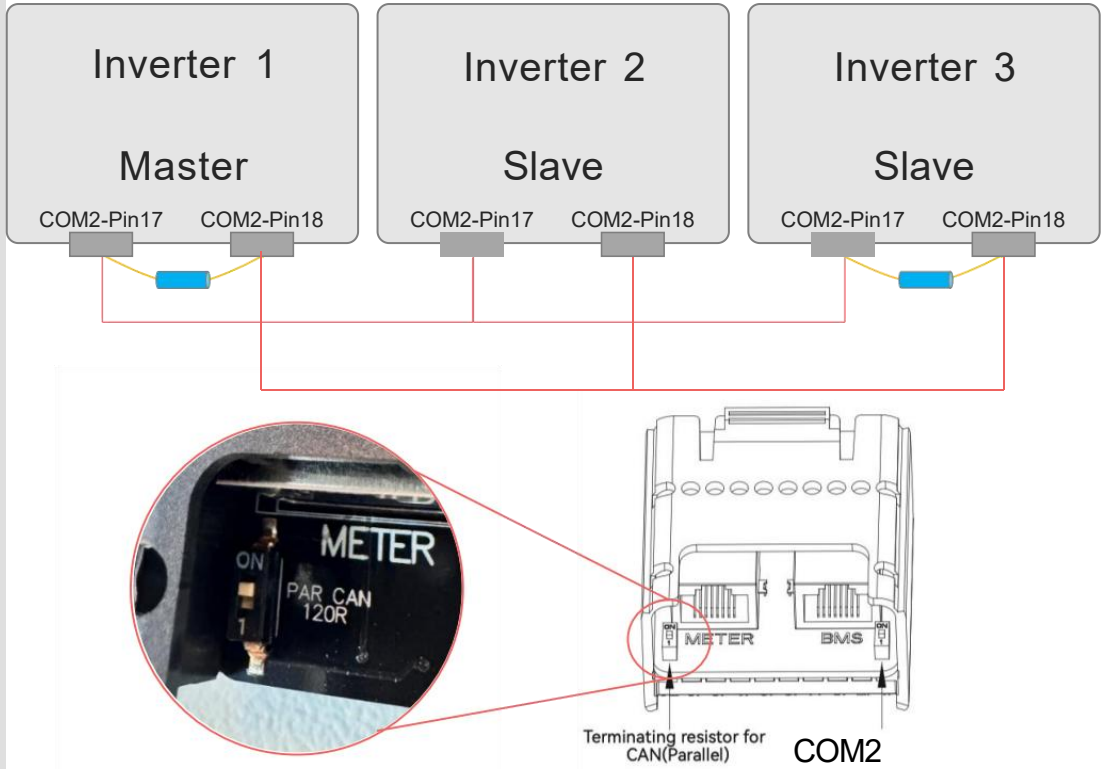
- **Dongle**: Each inverter needs to be connected to a communication module.
- **Smart meter**: Ensure meter RMM communicates with the master inverter.
- **EDA**: Off-grid parallel requires access to the backup box.
- **DG**: Generator needs to support the start & stop via the DO signal.
- **ATS**: The external ATS shall have a normally open (NO) output signal circuit of backup power supply (diesel generator) auxiliary contact.
- **Breaker**: Each inverter needs an independent AC breaker.

OTHER NOTICE

- **Phase sequence**: The phase sequence in the On-grid side and Back-up side of parallel inverter system must be align.

COMMUNICATION

- **Cables**: The CAN communication cables between inverters must be shielded twisted pairs.
- **Resistors**: The CAN communication of all inverters must be working properly, and terminal resistors for CAN bus at the first and last inverter needs to be turned on.



* Only the first or the last inverter can be set as the master.

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04

App Configuration

Off-grid Paralleling APP Configuration

Notice: Before setting parameters, you need to complete the following steps:
1. Installation and wiring.
2. Create a power plant on the monitoring platform or IntegHub APP.
3. Add all inverters to the plant via the app.

1. Check firmware

Each paralleled inverter must meet: ARM≧05 & DSP≧05

2. Set inverter role

Set one inverter as the master, and type parallel units.

Set other inverters as slave.

3. Set work mode

Set the work mode of the master inverter, and it will auto-sync to the slaves.

4. Set phase sequence

Set phase sequence of master inverter to ensure the inverters and grid are aligned. The default is auto-adaptive.

5. Custom switches(Optional)

Optional setting. Custom can set them according to actual requirement.

Off-grid Paralleling APP Configuration

1. Check firmware

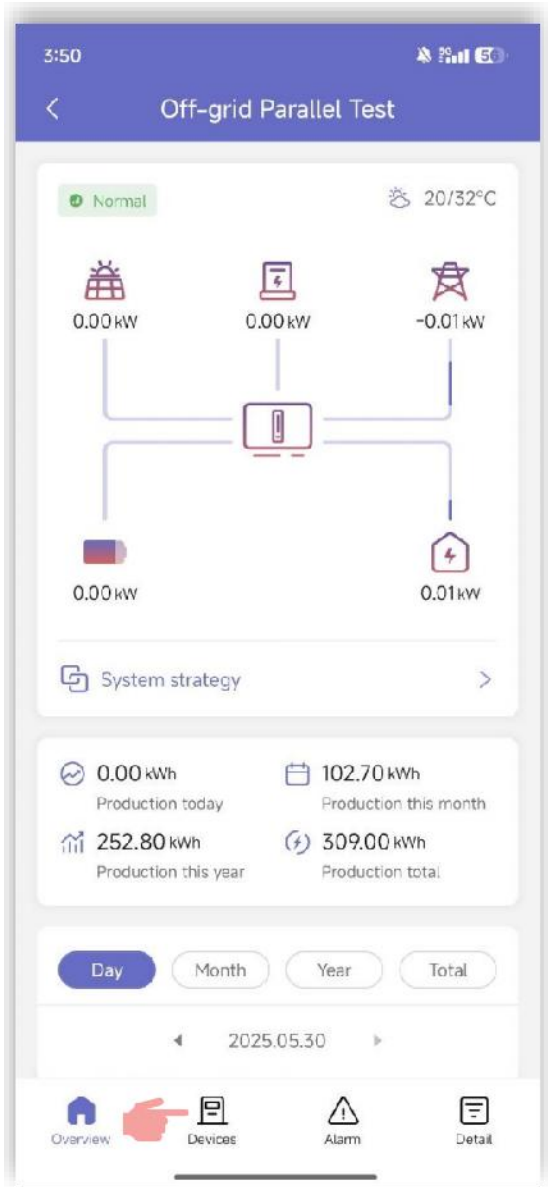
a. Click “Device” at plant page.

b. Enter into <Device> page, click the inverters.

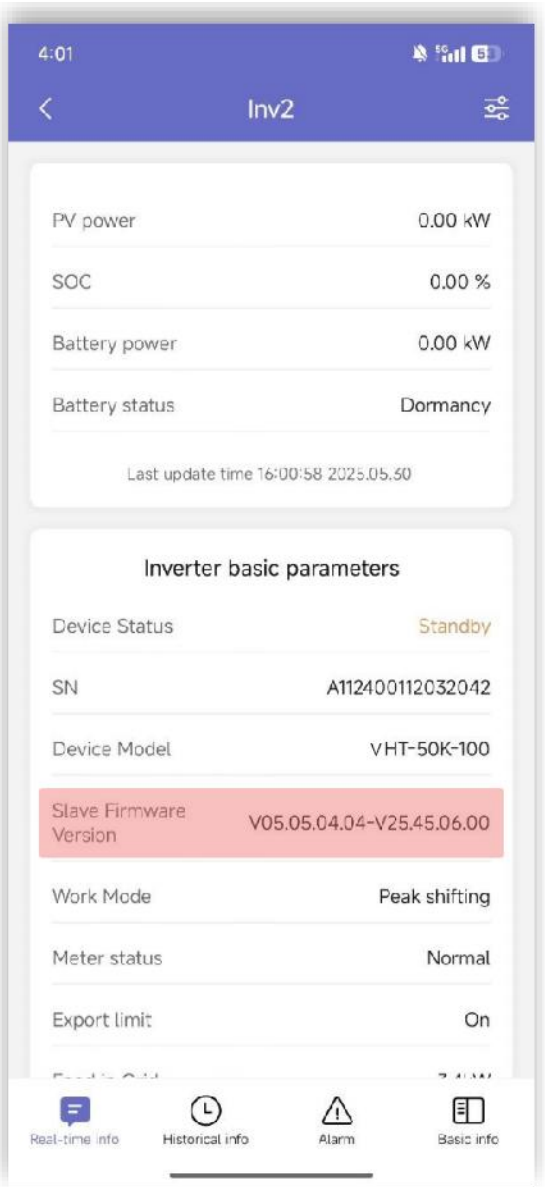
c. Check the “Slave Firmware Version” for all the parallel inverters.

d. The firmware version must be V05.05.**.**-V**.**.**.** or higher

e. If the firmware cannot meet the requirement, please contact your distributor to upgrade.







Off-grid Paralleling APP Configuration

2. Set inverter role

a. Enter into <Device> page, click “ ” buttons for inverters.

b. Enter into < Parameter settings > page, click “Feature parameters”.

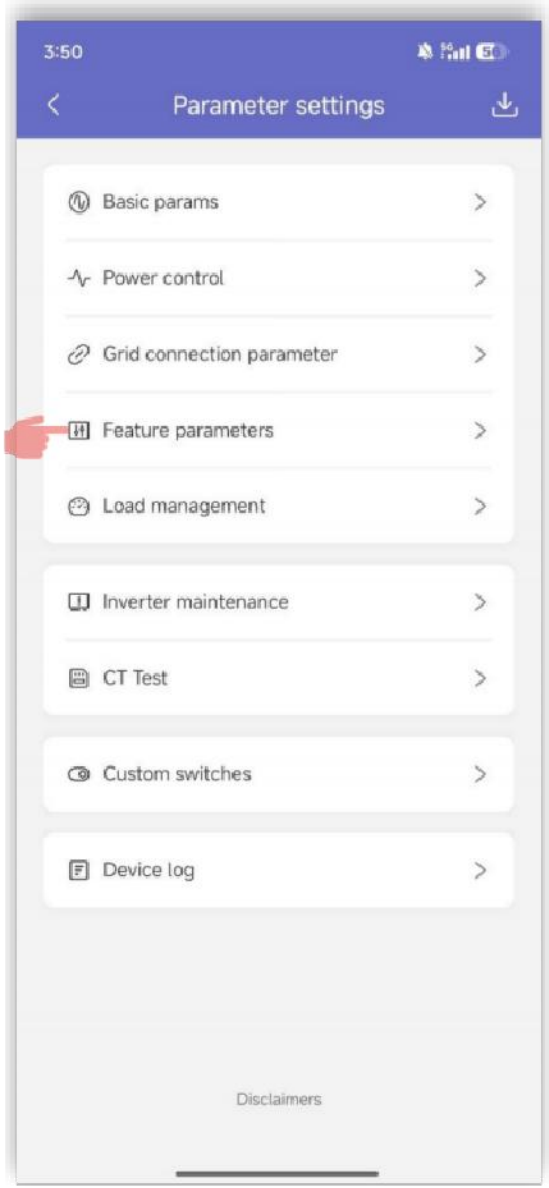
c. For master inverter, set the role as “master” and type parallel units*.

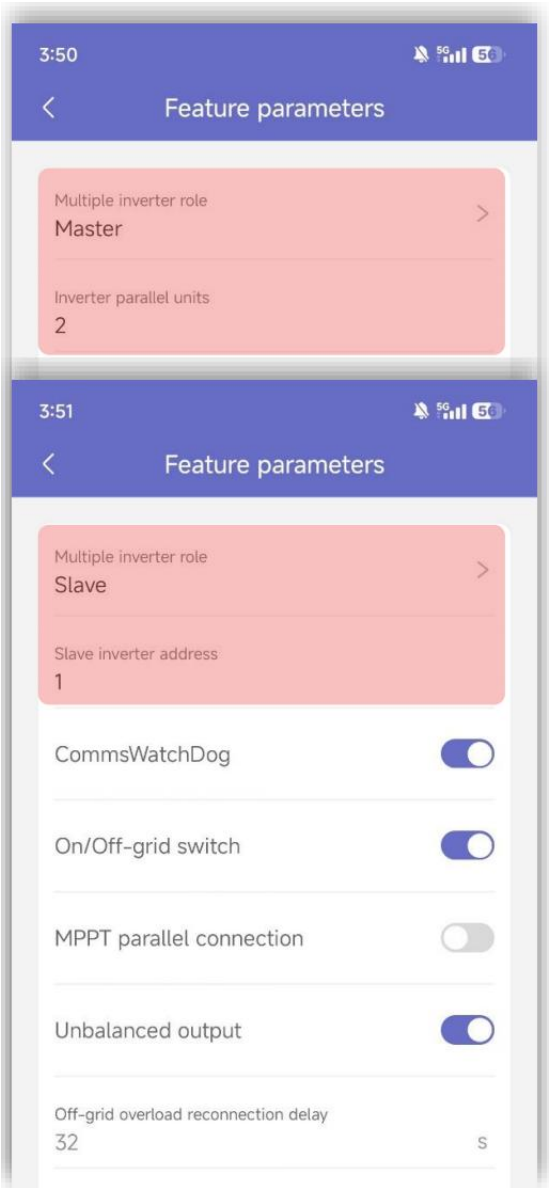
d. For slave inverters, set the role as “slave” and type the inverter address**.

* The master inverter starts working only when the detected online units match the set parallel units.

**The slave inverter addresses must start from 1 and be unique and consecutive.







Off-grid Paralleling APP Configuration

3. Set work mode

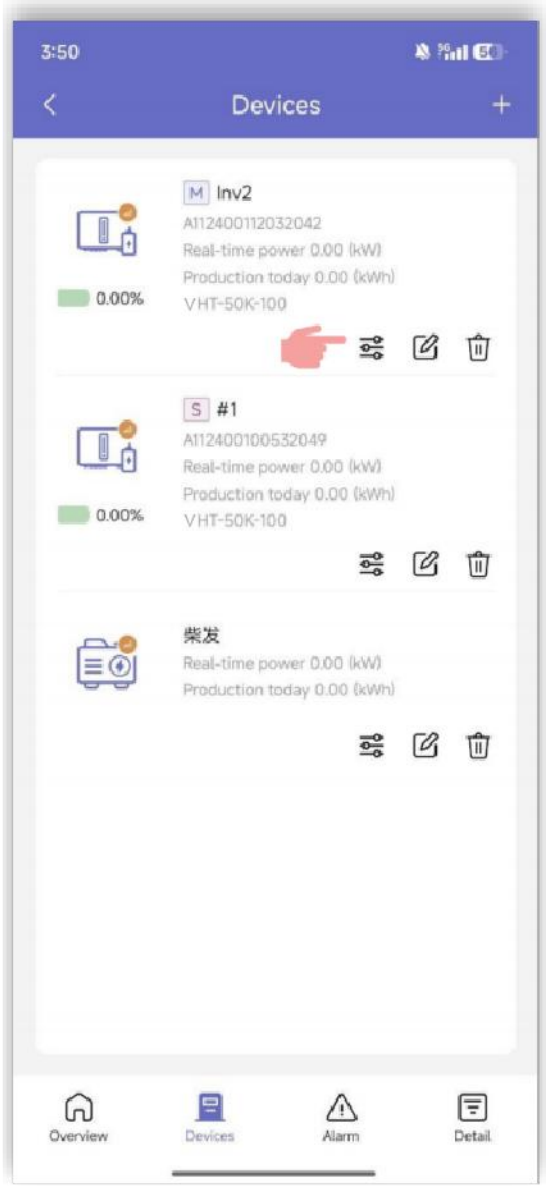
a. Enter into <Device> page, click “ ” buttons for master inverter*.

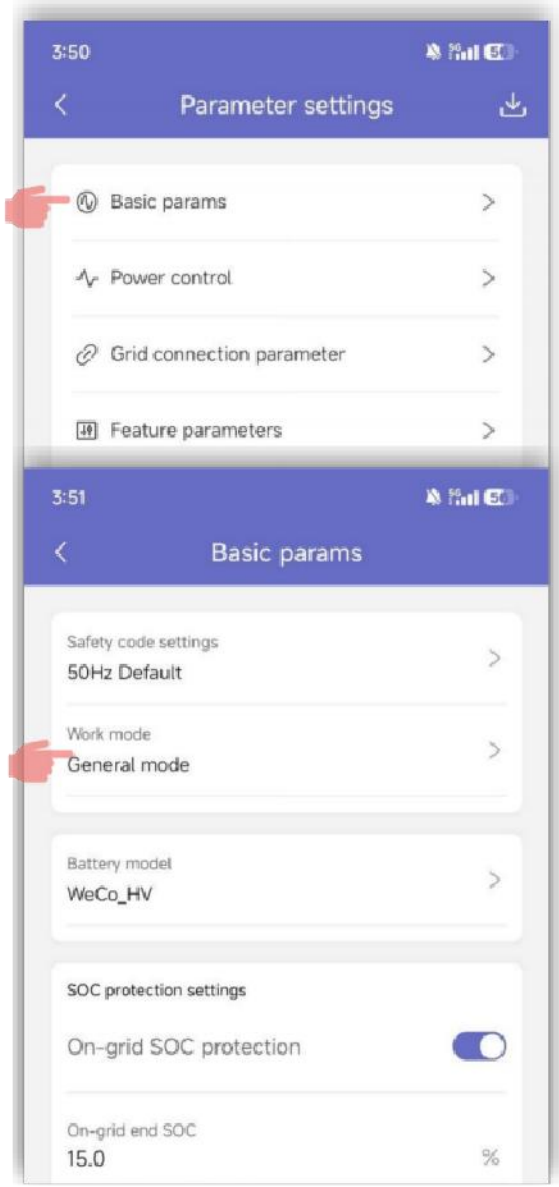
b. Enter into < Parameter settings > page, click “Basic params ”.

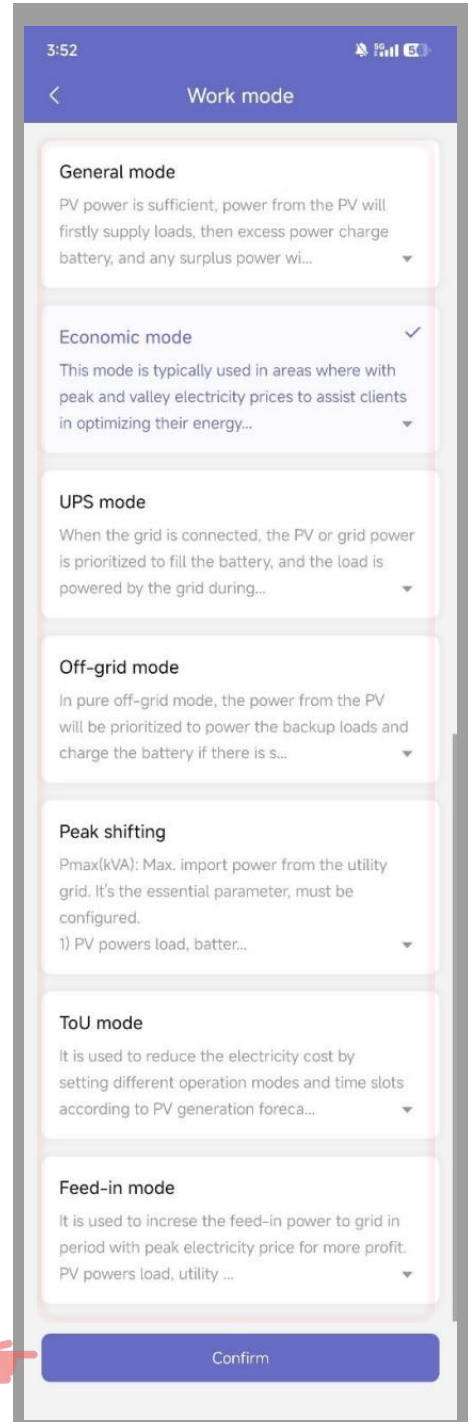
c. Click “Work mode” at <Basic params> page.

d. Select suitable work mode and click “Confirm”

* For off-grid paralleling system, only master inverter’s work mode need to be setting.







Off-grid Paralleling APP Configuration

4. Set phase sequence

a. Enter into <Device> page, click “ ” buttons for master inverter.

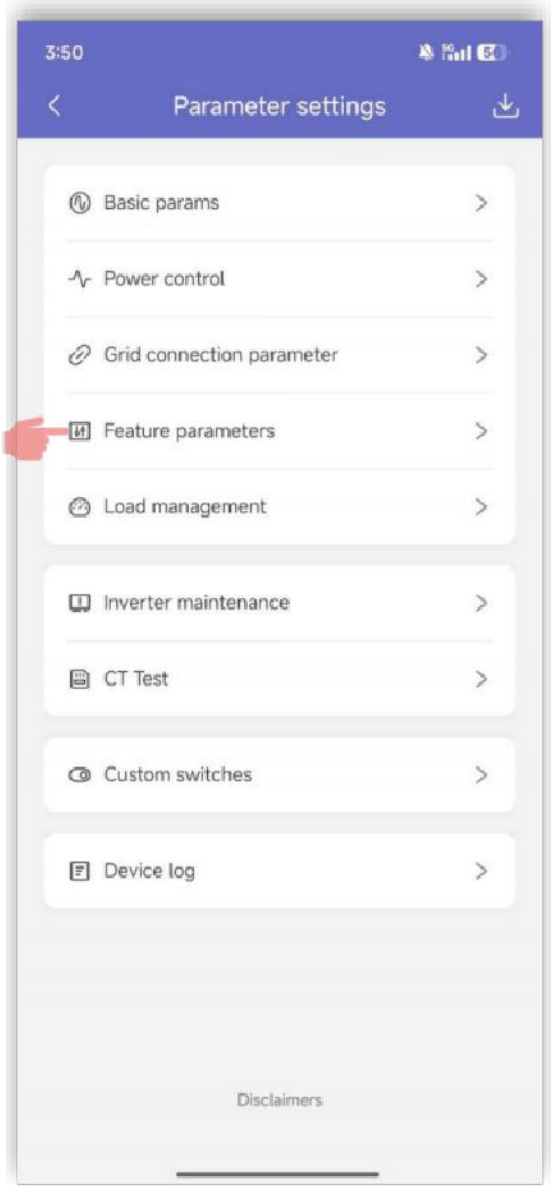
b. Enter into < Parameter settings > page, click “Feature parameters”.

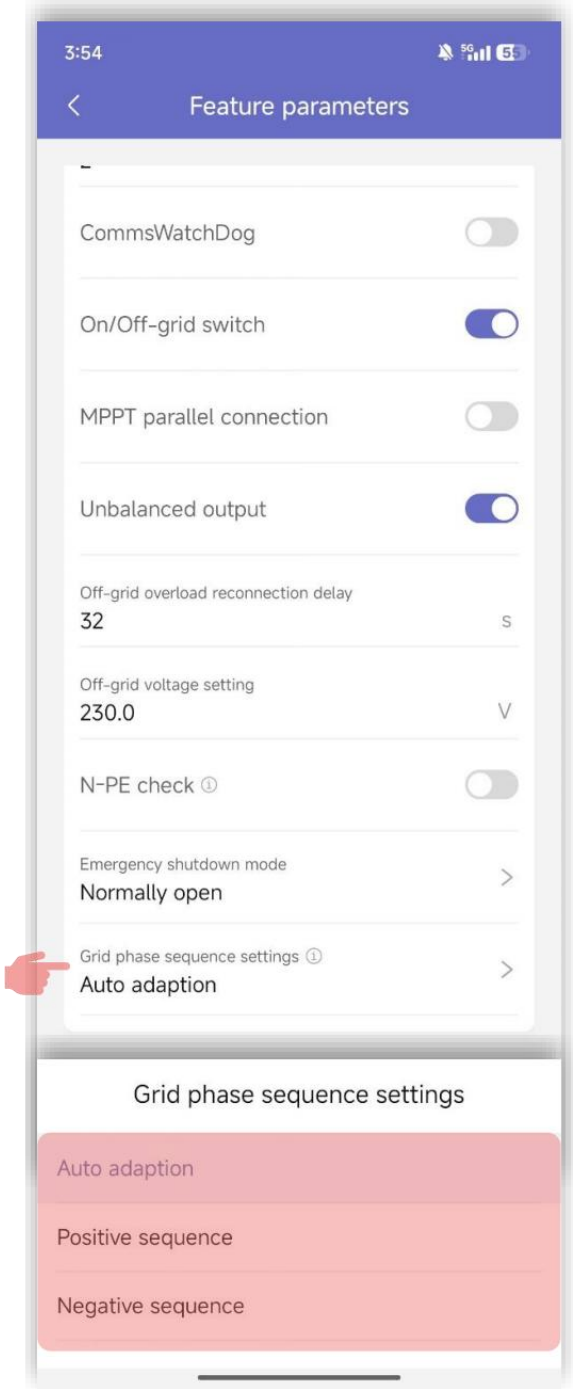
c. Click “Grid phase sequence settings” at < Feature parameters > page.

d. The default and suggested option is “Auto adaption”*, or you can switch to positive or negative according to actual use.

* For the African region, it is recommended to select the “Positive sequence”.







Off-grid Paralleling APP Configuration

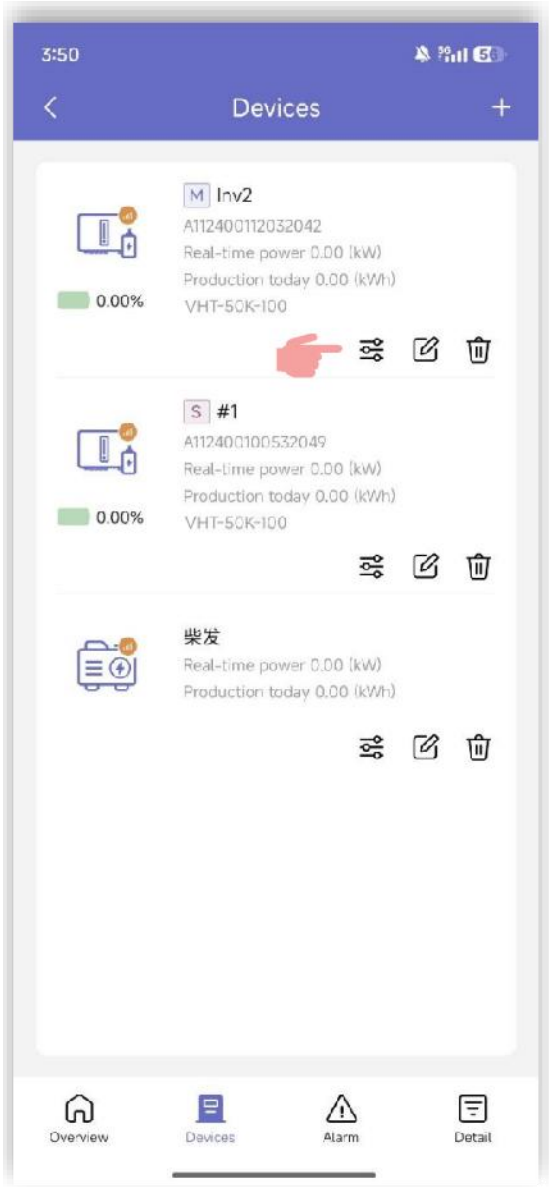
5. Custom switches (Optional)

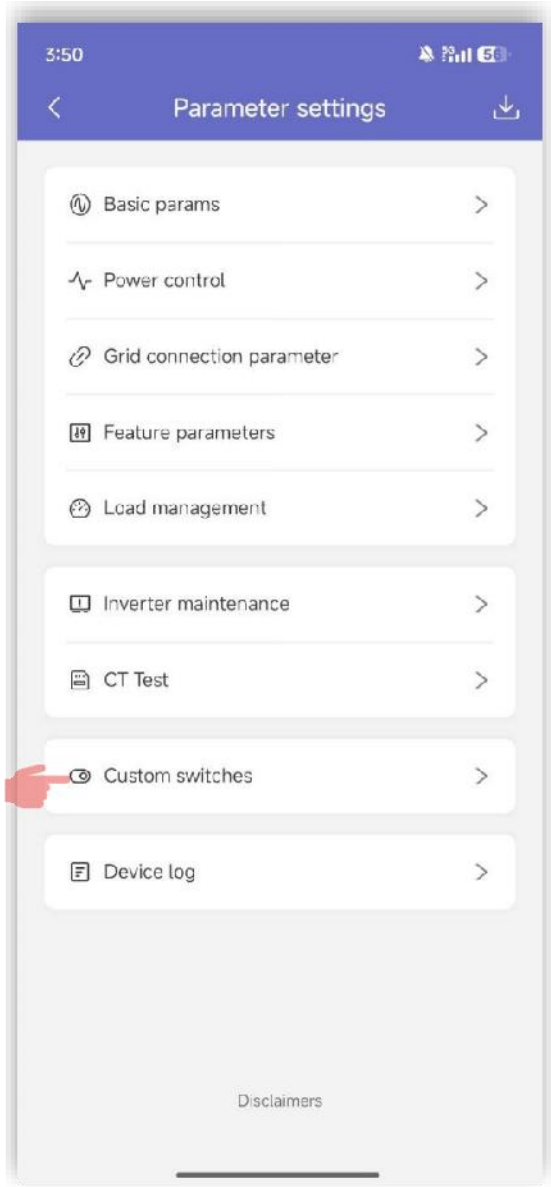
a. Enter into <Device> page, click “ ” buttons for master inverter.

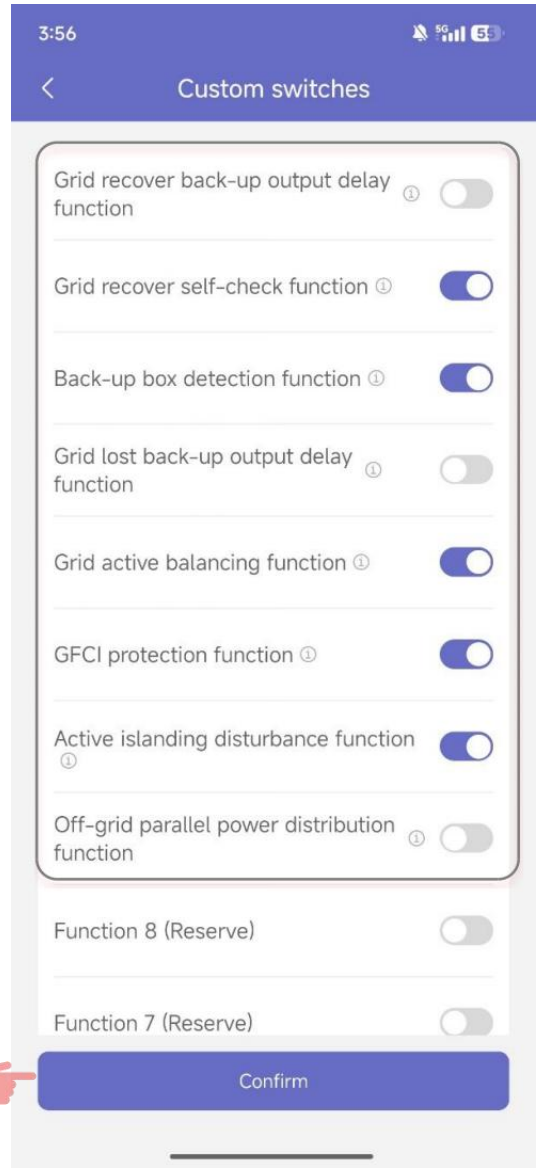
b. Enter into < Parameter settings > page, click “Custom switches”.

c. Customize settings these switches according to specific usage scenarios and requirements.

* It is not recommended to make changes to this page. If any changes are required, please contact the service team.







Diesel Generator APP Configuration

1. Add DG device via IntegHub APP

a. You need to have a hybrid inverter power plant on Veichi cloud before using this function.

b. Click "+" button on "Devices" page, and choose Third-party devices from the list, touch Diesel generator icon.

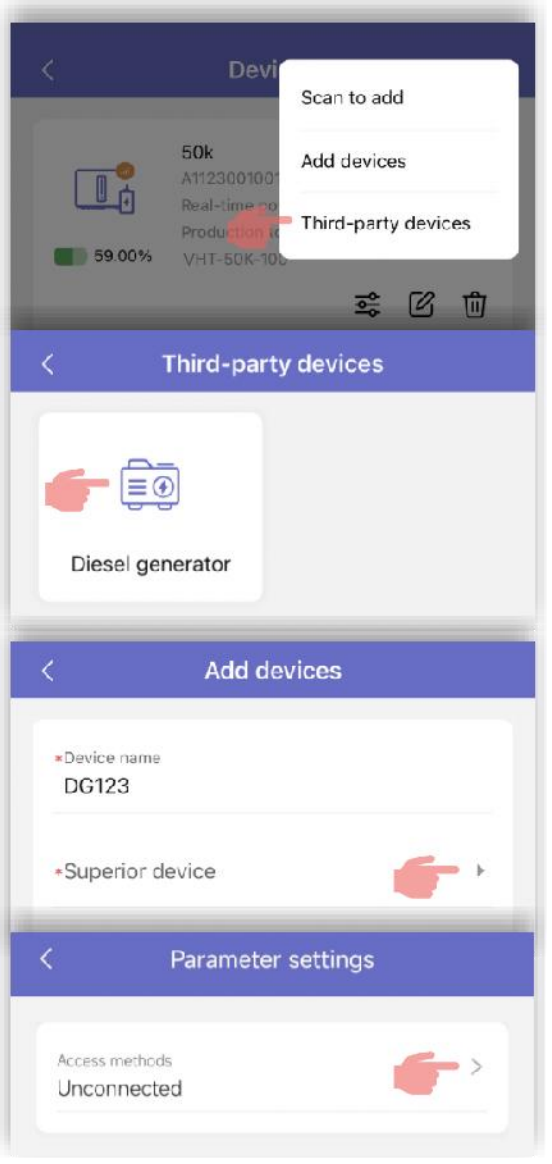
c. Name the diesel generator and select inverter SN that you are going to connect with this diesel generator by clicking the Superior device.

d. Click "Unconnected".

2. Select the DG access method

3. Set DG parameters





Diesel Generator APP Configuration

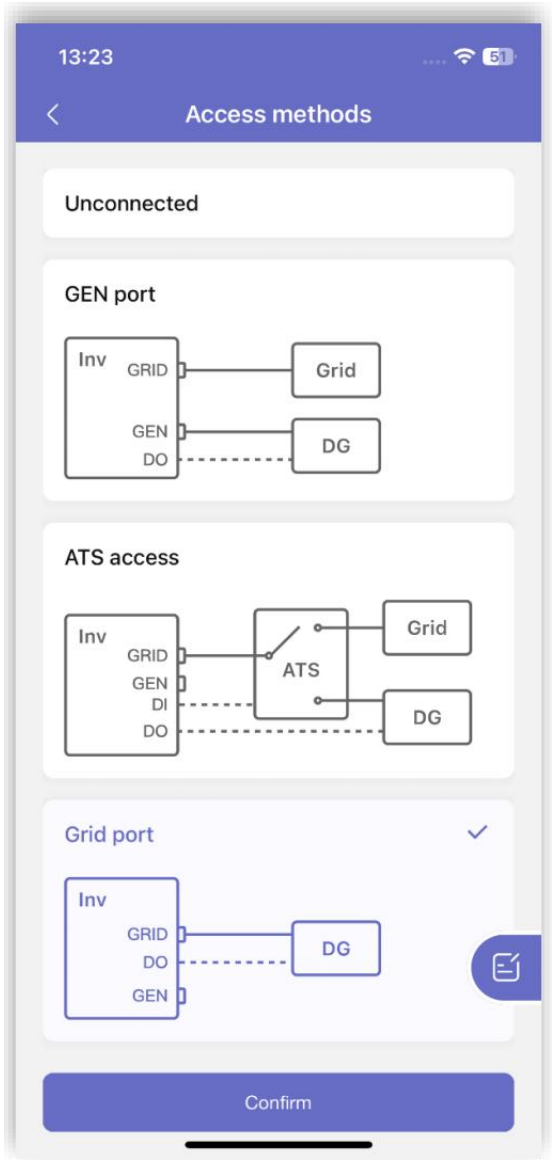
2. Select the DG access method

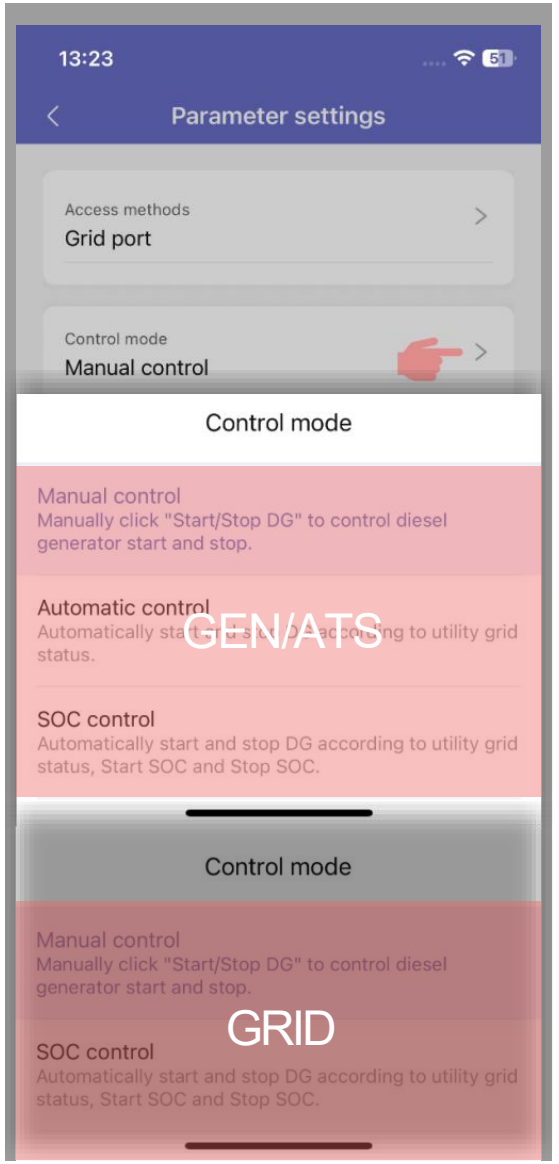
a. Select the diesel generator access method as per to the real case, click “Confirm”.

b. Click the “Right arrow” behind the control mode to select your preferred mode.

Note: DG connected at the inverter On-grid port only includes “Manual control” and “SOC control” two methods, while DG connected at the inverter GEN port or connecting through the ATS offer an additional ”Automatic control” method.

3. Set DG parameters



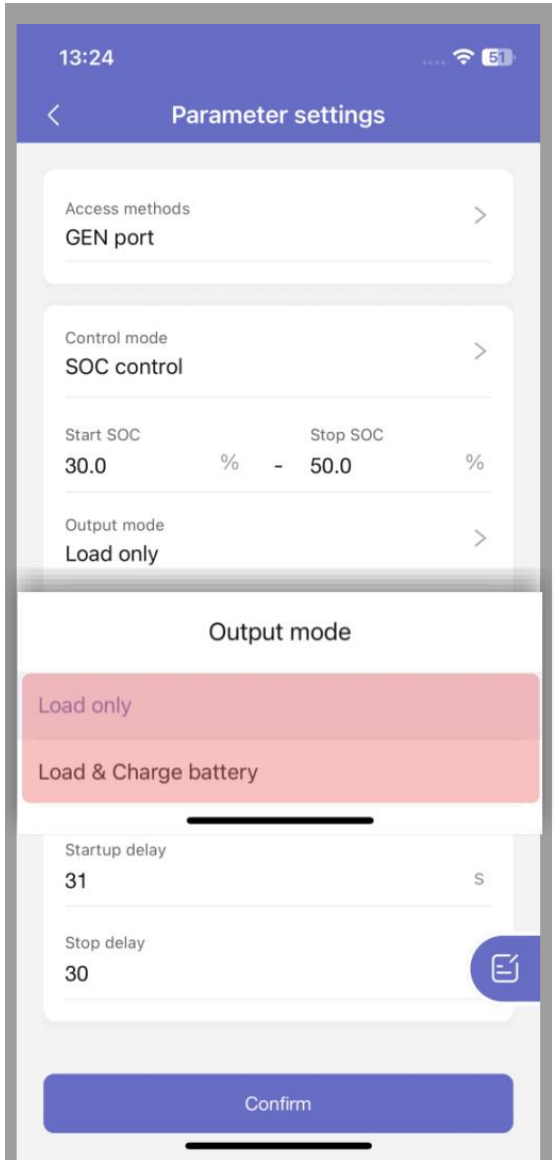


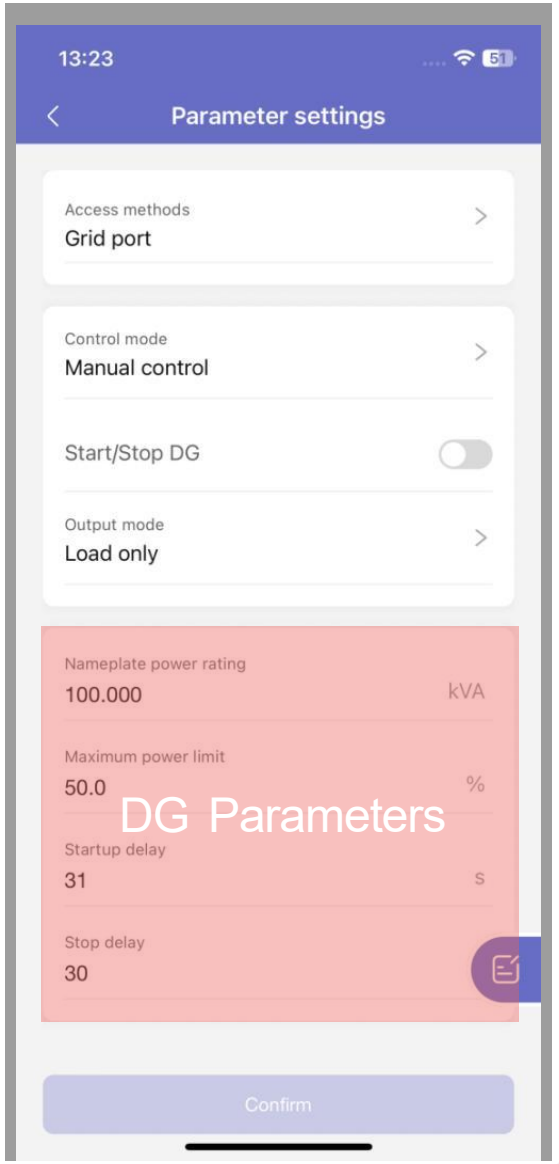
Diesel Generator APP Configuration

3. Set DG parameters

a. Set the “Output mode” of the diesel generator according to your preference by clicking the “Right arrow” behind it. If you select the “Load only” , the diesel generator will only supply loads after it is activated, and the “Load & Charge battery” means the diesel generator can be used for loads and battery charge after it’s activated.

b. Configure the necessary diesel generator parameters according to its nameplate and real case.





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05

Case Study

Case Study - Off-grid Parallel Solution with DG

Yangon, Myanmar

Inverter: VHT 50K × 2 units
Battery: 140kWh × 2
Diesel generator: 200kW × 1 unit



100kw + 280kwh

Before Installation

Diesel generators are often used because the power grid is only available for 4 hours daily.

The troubles caused by DG for customers include:

- High costs
- Significant noise
- Potential difficulty in obtaining diesel fuel

After Installation

The batteries store electricity when the grid is available and supply power to the loads when the grid fails. （UPS mode）

The benefits of Veichi's parallel system for customers include:

- Cost-effective
- Quieter, for a more comfortable energy experience
- Seamlessly integrates with the customer’ s existing DG
- No fear of power outages

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06

Q&A

Q&A

01

Q: What is the requirement for the CAN cables between paralleled inverters?

A: The CAN communication cables between inverters must be shielded twisted pairs.

02

Q: What is the rated capacity of the diesel generator connected to the system?

A: It is preferable that the capacity of the diesel generator is greater than 1.5×Ptotal. If the diesel generator has a lower power rating, it is more likely to cause unstable power supply.

03

Q: Can the system realize zero power export to the diesel generator?

A: Yes. Since the DG and the inverter don,t supply power to the load simultaneously, no power will be exported to the DG. (Premise: Wiring and configuration are done as per regulations.)

04

Q: If there's an inverter failure in the parallel system, how will the system operate?

A: Parallel system works as a whole, the slave inverter can be isolated if it,s failed whereas master inverter cannot.

Q&A

05

Q: How to keep the system running if the master fails and the replacement hasn't arrived?

A: Follow these steps to reassign the master inverter:

① Suggest to choose the slave inverter next to the original master to be the new master.
② Disconnect the CAN line between the new master and the original master.
③ Change the meter communication line to the new master.
④ Turn on the terminal resistors on the first and last inverters.
⑤ Reconfigure the system using IntegHub APP.

07

Q: How to unlock V2.0 features on the existing off-grid parallel system ?

A: ① Firmware upgrade - Update every inverter to V05.05.**.**-V**.**.**.** or later.
② App reconfiguration - Follow the step-by-step guide on pages P22-P27.


Thank You