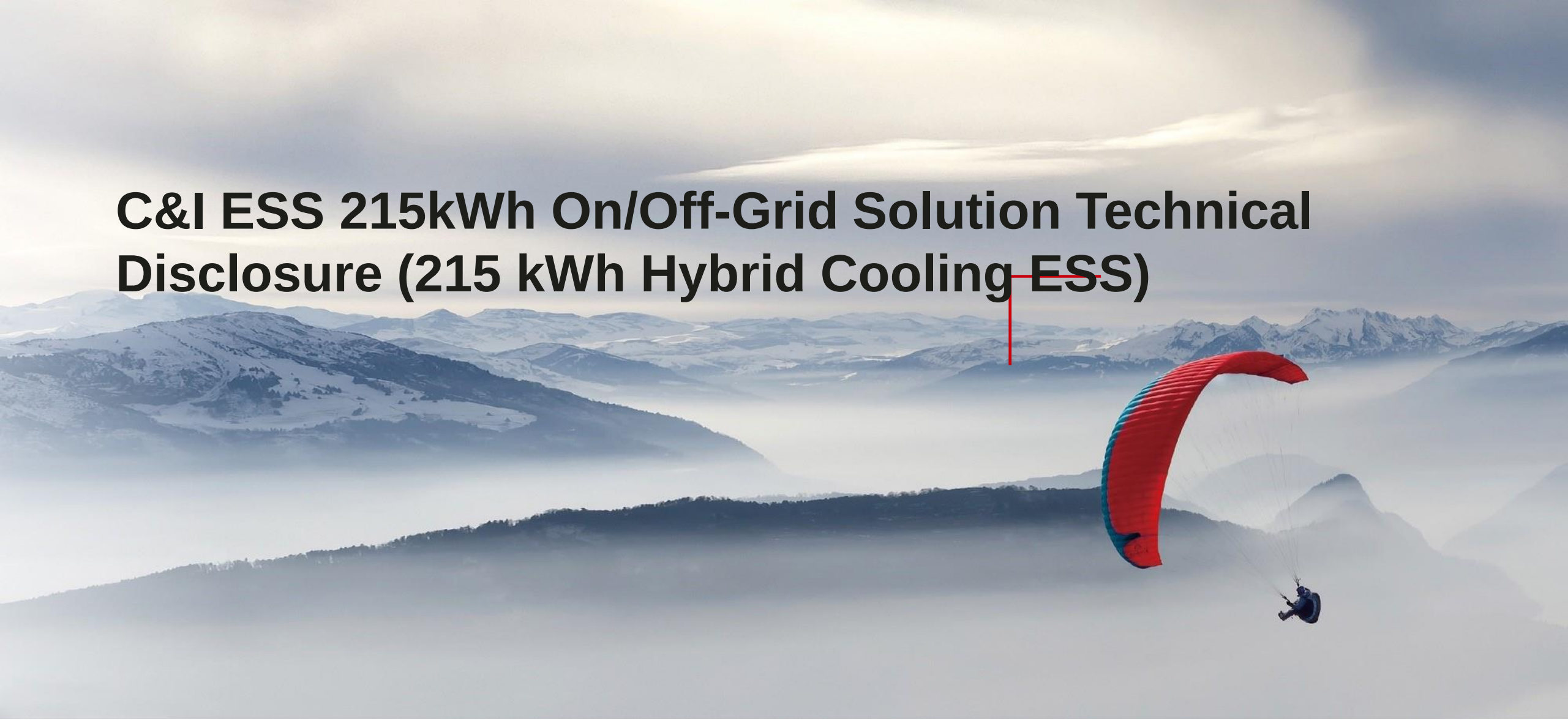
C&I ESS 215kWh On/Off-Grid Solution Technical Disclosure (215 kWh Hybrid Cooling ESS)



Security level:

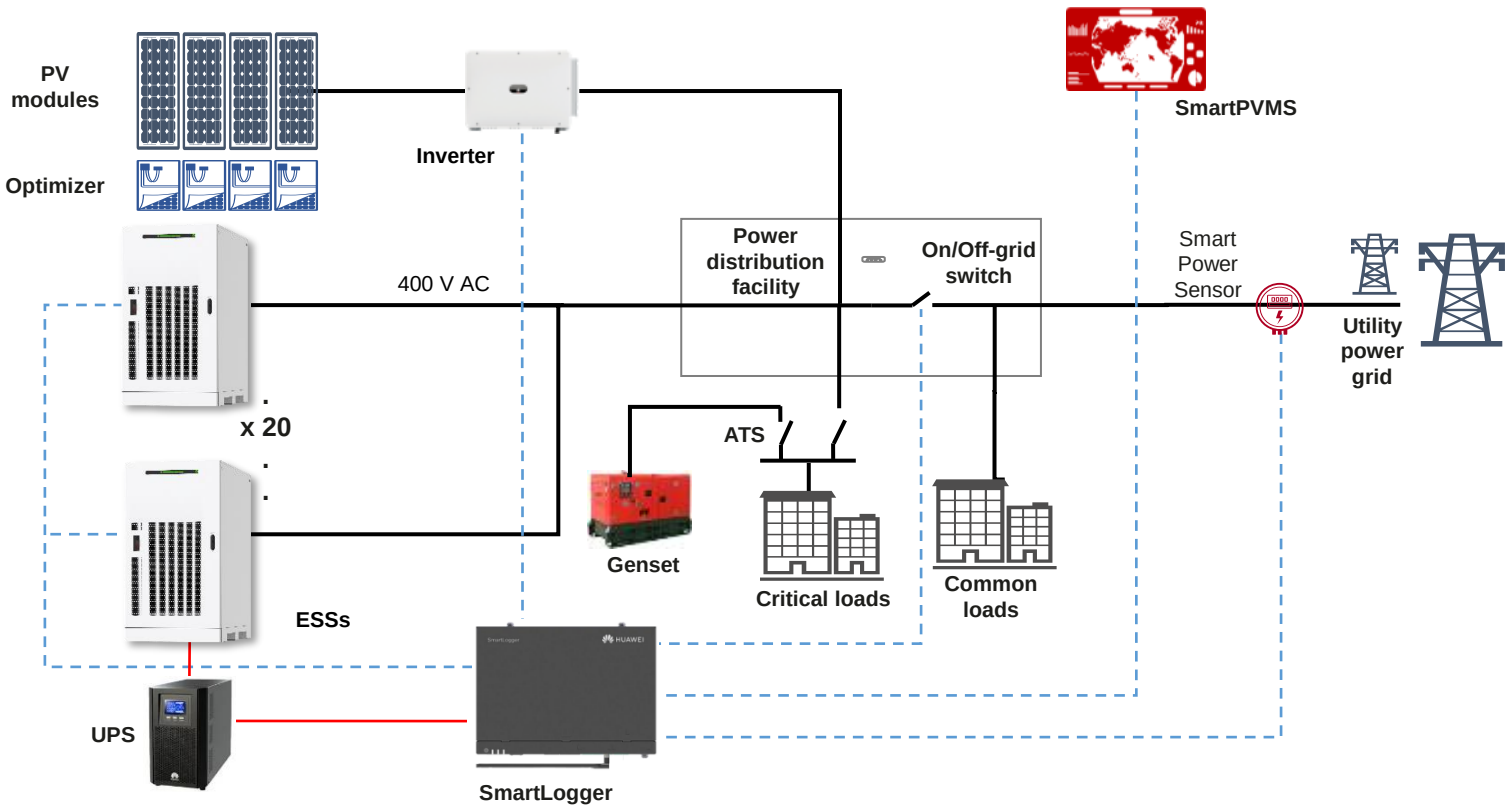
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Scenario 1: PV+ESS On/Off-Grid Seamed Switching System



Product combination relationship

ESS	LUNA2000-215-2S10; 380/400/415 V AC
PV inverter	V3, M3, V5/V5+, and V6, for example, SUN2000-(50KTL-M3)
Data logger	SmartLogger

Type	Performance Specification/Requirement
Number of grid connection points	Single grid connection point, single SmartLogger
Capacity	PV-to-ESS ratio < 2:1
Number of ESSs connected in parallel	≤ 20
Number of PV modules connected in parallel	≤ 30
Communication distance limit	RS485: 1000 m FE: 100 m 4G (SmartPVMS)
On/Off-grid controller	The SmartLogger functions as an on/off-grid controller.
On/Off-grid feature	Seamed manual/automatic on/off-grid switching **Switching time:** 3s for a single ESS and 10s for multiple ESSs. The power backup function is supported.
Meter	Self-developed meter
Management system/app	The FusionSolar SmartPVMS is supported.
On-grid operation	The on-grid mode is supported. (When the SmartLogger is used as the on/off-grid controller, and remote communication scheduling is not supported.)

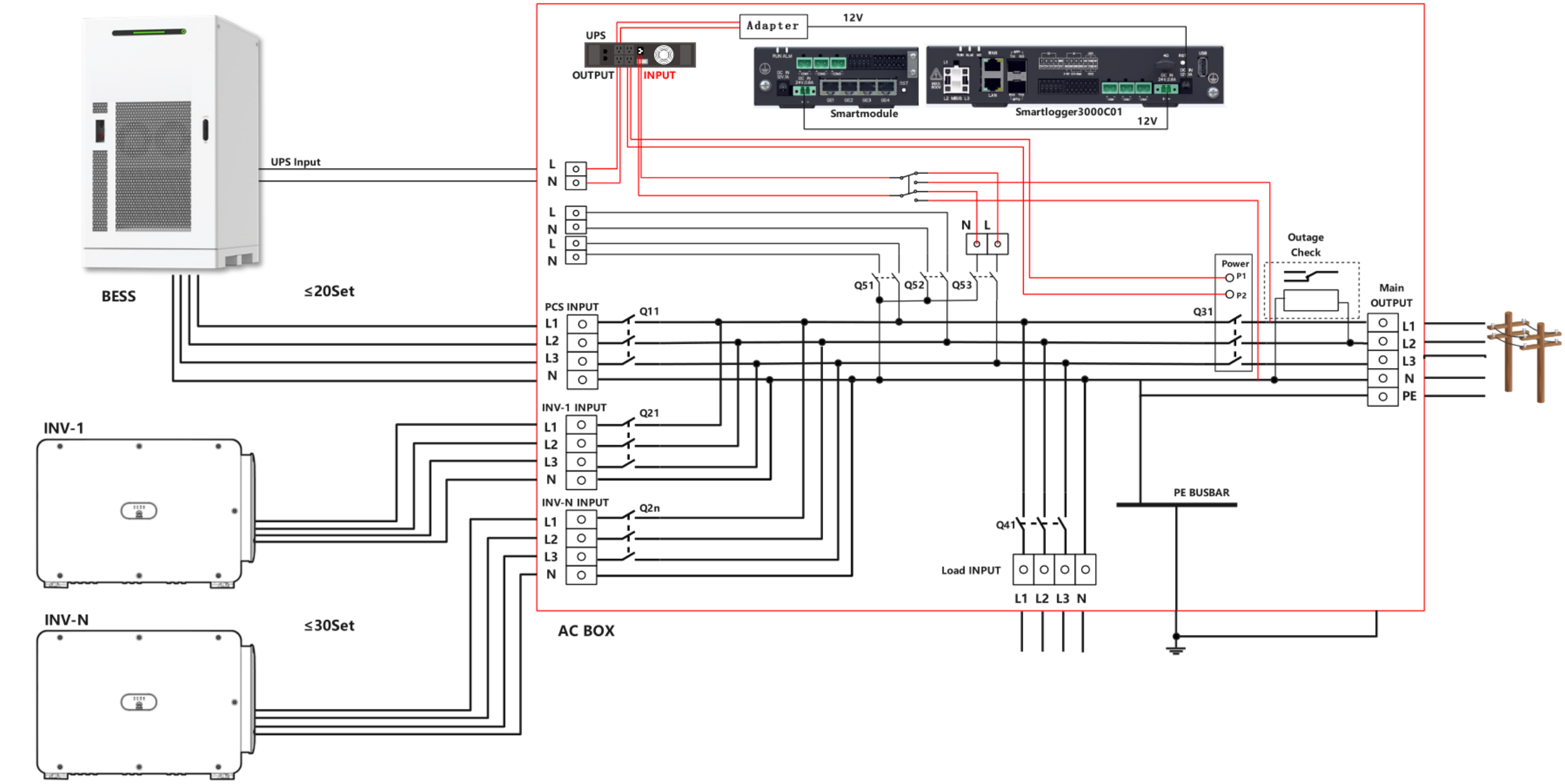
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Main Devices in On/Off-Grid PV+ESS Scenarios (Seamed On/Off-Grid Switching)

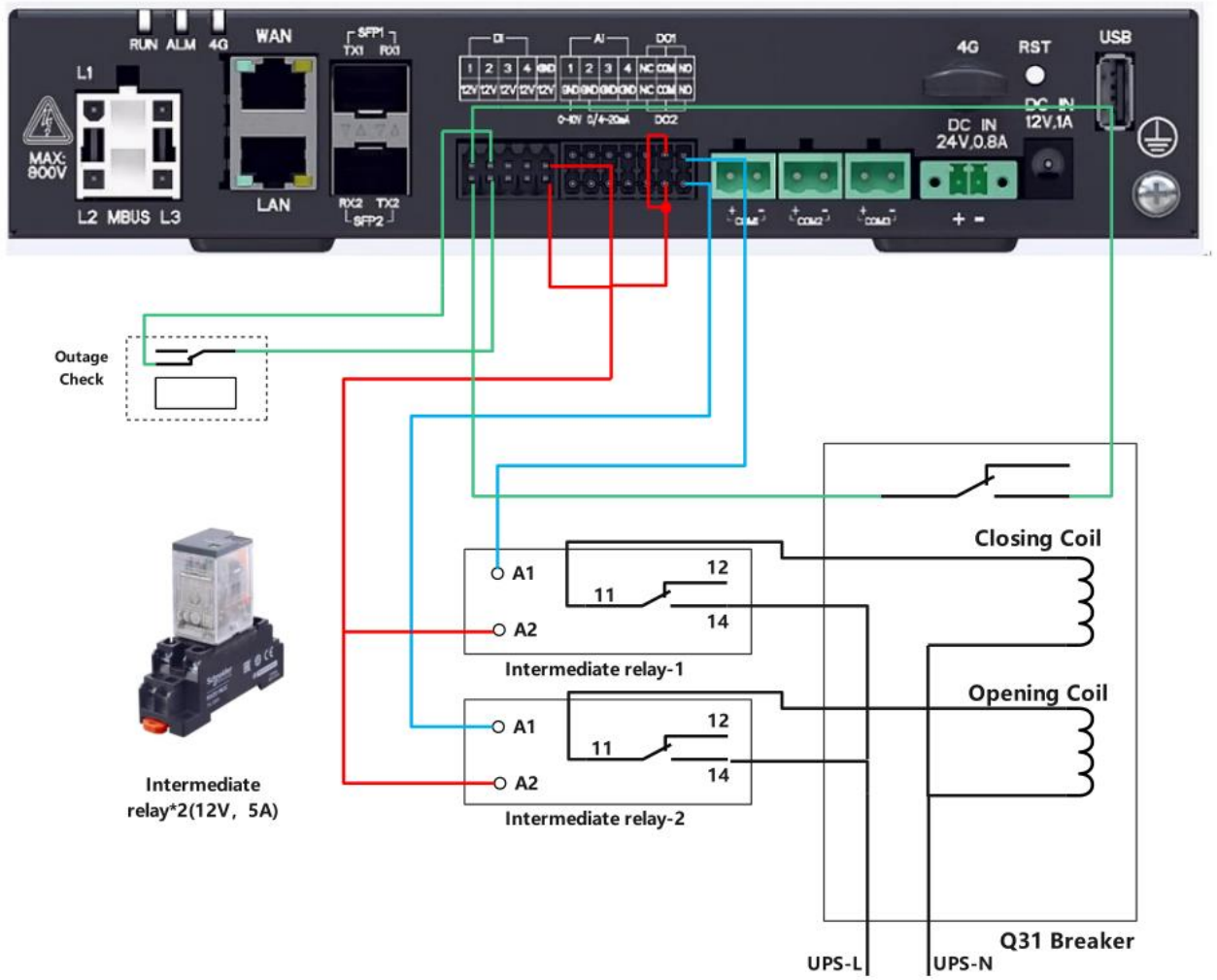
No.	Device	Model	Unit	Qty.	Supplier	Remarks
1	Smart String ESS	LUNA2000-215-2S10	pcs	≤ 20	Huawei	
2	On/Off-grid controller/SmartLogger	SmartLogger3000+SmartModule	pcs	1	Huawei	For details about the configuration in China and other specific regions, see the configuration manual. Can be installed in a third-party switch cabinet.
3	PV inverter	V3, M3, V5/V5+, V6	pcs	≤ 30	Huawei	• V3 is used only in the installed base market. • To prevent resonance and stability risks, inverters of different models cannot be used together.
4	Optimizer	Compatible with the inverter	pcs	N/A	Huawei	Optional
5	Management system	FusionSolar SmartPVMS	pcs	1	Huawei	
6	Three-phase meter	Self-developed meter	pcs	1	Huawei	
7	On/Off-grid switch cabinet	1. Integrates the **on/off-grid switch**. **2. UPS power distribution switch**: The UPS input supports dual power supply switching. 3. The automatic switching mode requires the **power failure detection relay** and controllable switch. **4. UPS:** ≥ 1 kVA, online UPS, 220 V **5. AC input power distribution switch** for PV modules and ESSs 6. Space shall be reserved in the cabinet for installing the SmartLogger and SmartModule. 7. The cables from the inverter and battery to the PDC shall be at least 5 m long.	pcs	1	Third party	The three-phase voltage monitoring relay is recommended for the automatic switching mode.

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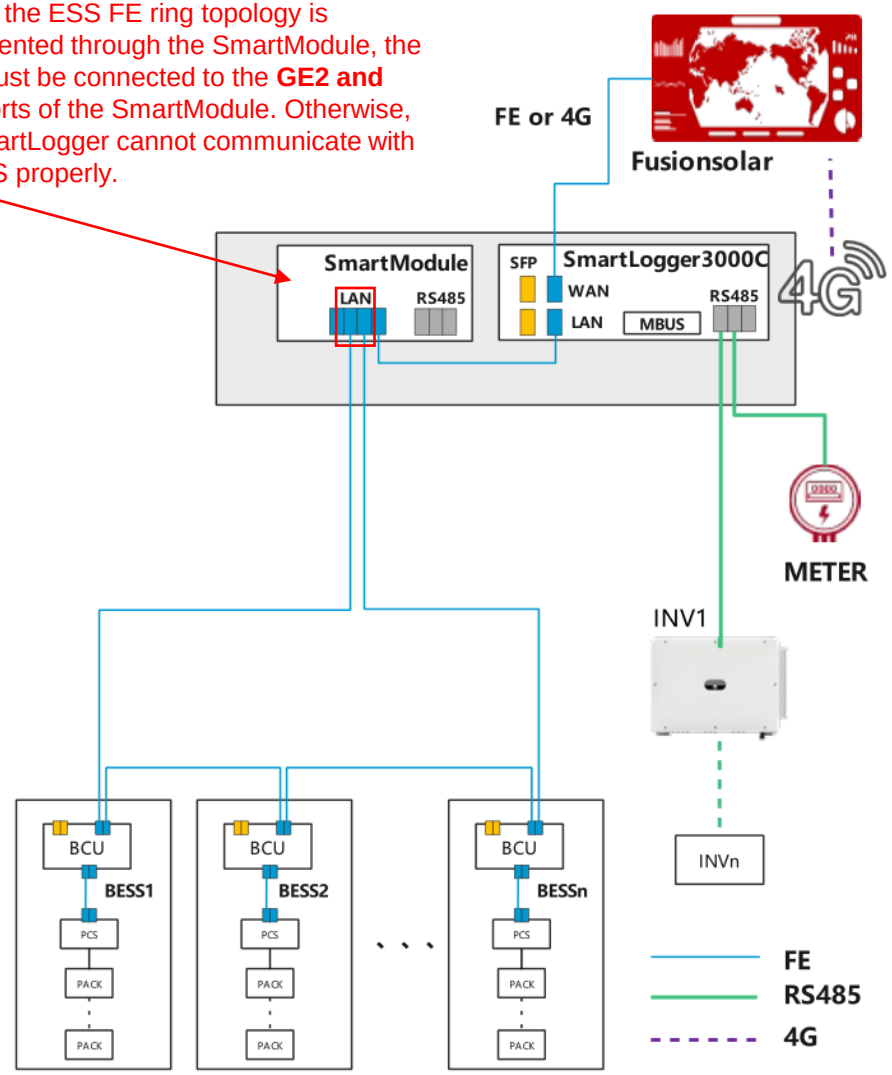
Electrical Networking Mode - Seamed Switching Scenario



Communication Networking Mode - Seamed Switching Scenario



Note: If the ESS FE ring topology is implemented through the SmartModule, the ESS must be connected to the **GE2 and GE3** ports of the SmartModule. Otherwise, the SmartLogger cannot communicate with the ESS properly.



The PV+ESS on/off-grid system can be networked using the SmartLogger and SmartModule. The restrictions are as follows:

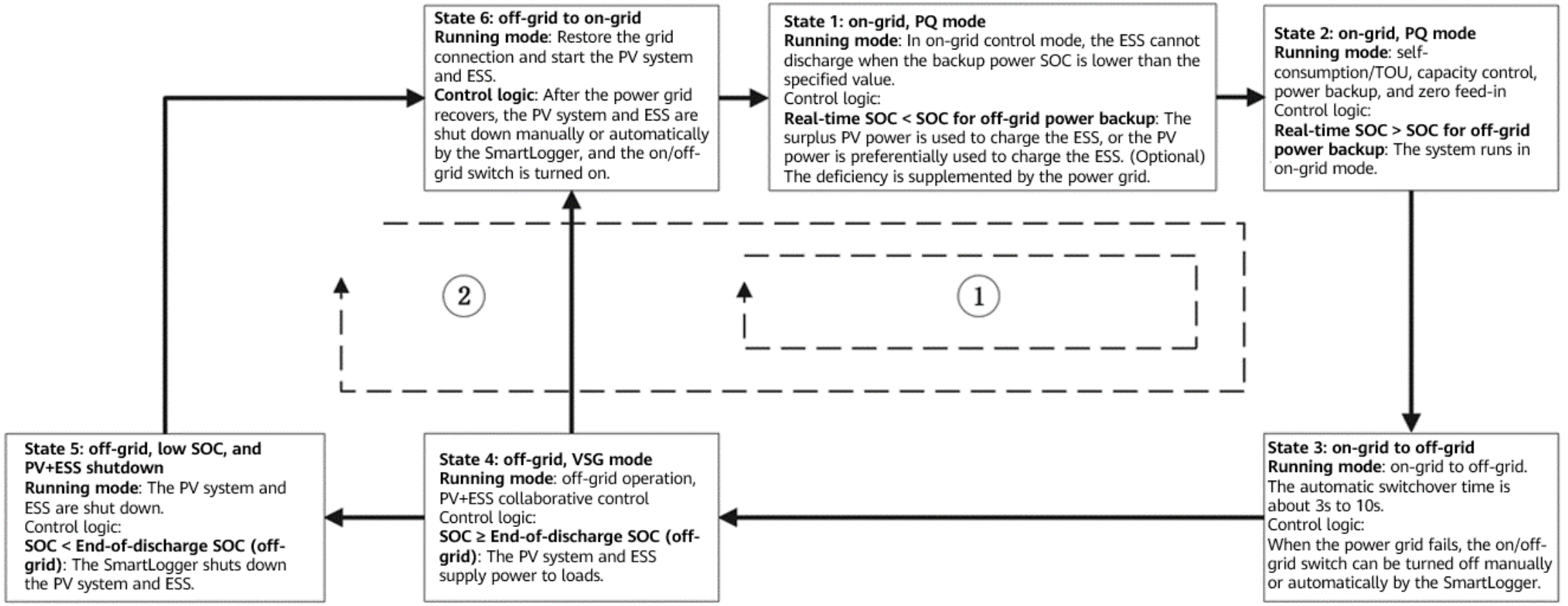
(1) The PV inverter and meter support RS485 communication networking.

(2) The ESS supports FE ring networking.

(3) The SmartLogger connects to the SmartPVMS over 4G.

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Control Logic - Seamed Switching Scenario



Note:
Running logic 1: states 1 to 4 and state 6;
running logic 2: states 1 to 6.

Note: After the PV+ESS system runs in off-grid mode, the system automatically starts when the irradiance becomes sufficient. If no controllable load switch is connected to the SmartLogger, the estimated power threshold shall be greater than the load power.

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Constraints

The constraints on the C&I on/off-grid scenario are as follows:

1. **When the SmartLogger functions as the on/off-grid controller, it is not recommended that the SmartLogger send scheduling commands to northbound devices. Only the application scenario with a single grid connection point and a single SmartLogger is supported.**

2. **Only low-voltage coupling is supported. Medium-voltage coupling is not supported.**

3. **In the seam on/off-grid switching scenario, the PV-to-ESS ratio is less than 2:1.**

4. **In VSG mode, the SOC of the ESS is between 10% and 90%.**

5. **ESSs of different specifications cannot be used together.**

6. **Generally, genset is not configured in the seamed on/off-grid switching scenario. If the genset is available, the genset shall be connected to loads using the ATS. The ATS switching delay shall be increased by more than 30s to reduce the PV+ESS seamed switching time. Otherwise, the ATS may be triggered or the genset may be started or stopped.**

7. **UPS requirements: power ≥ 1 kVA, online UPS, 220 V AC, backup time ≥ 1 hour (If the off-grid operation lasts for a long time, the UPS backup time shall be greater than 48 hours.)**

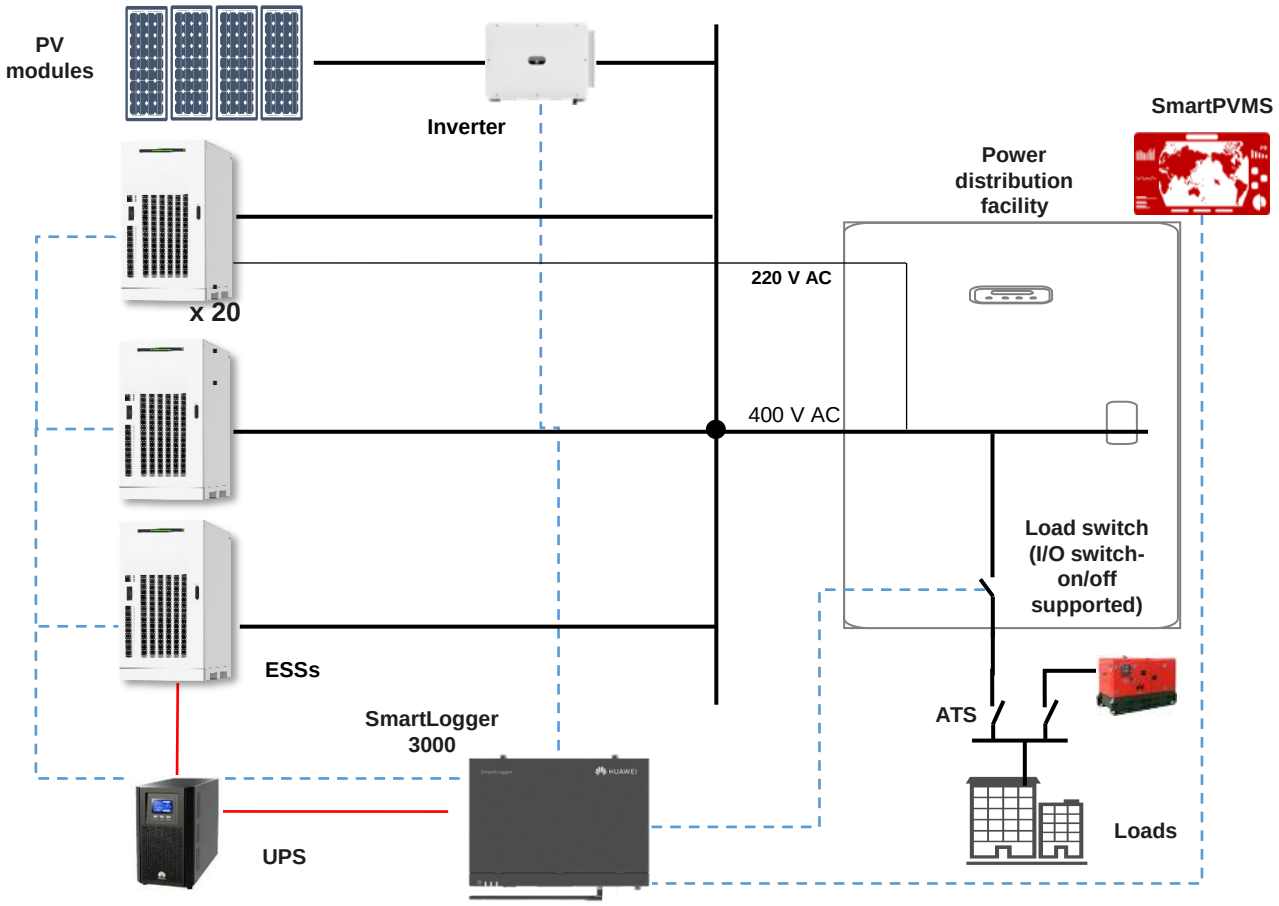
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Scenario 2: Off-Grid PV+ESS System



Type	Performance Specification/Requirement
Capacity	PV-to-ESS ratio < 2:1
Number of ESSs connected in parallel	≤ 20
Number of PV modules connected in parallel	≤ 30
Communication distance limit	RS485: 1000 m FE: 100 m 4G (SmartPVMS)
On/Off-grid controller	The SmartLogger functions as an on/off-grid controller.
On/Off-grid feature	Supports off-grid operation. Supports automatic black-start. Supports load shedding upon low electricity.
Management system/app	The FusionSolar SmartPVMS is supported.
Meter	Self-developed meter

Product combination relationship

ESS	LUNA2000-215-2S10; 380/400/415 V AC
PV inverter	M3, V5/V5+, V6
Data logger	SmartLogger3000

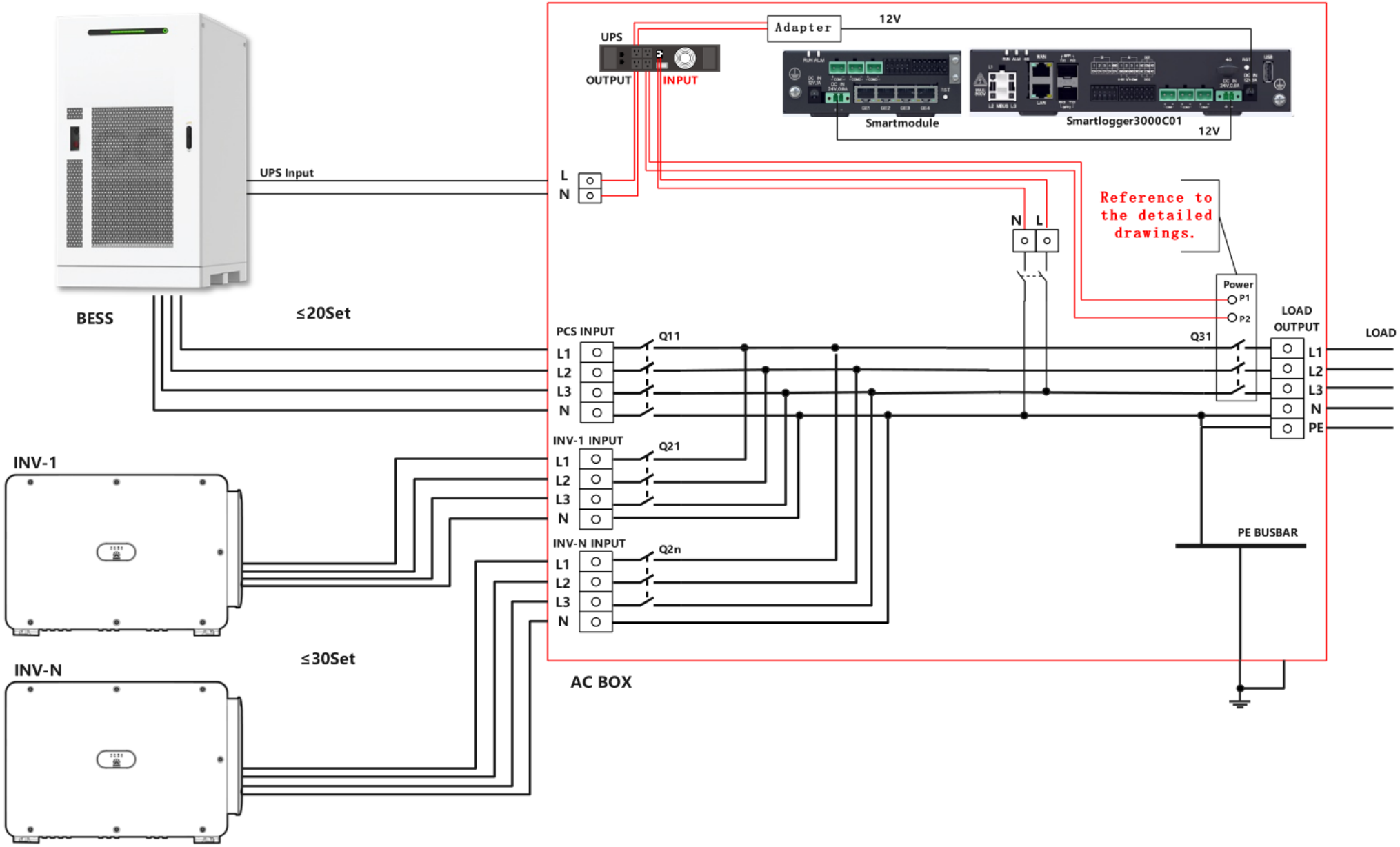
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Main Devices in Off-Grid PV+ESS Scenarios

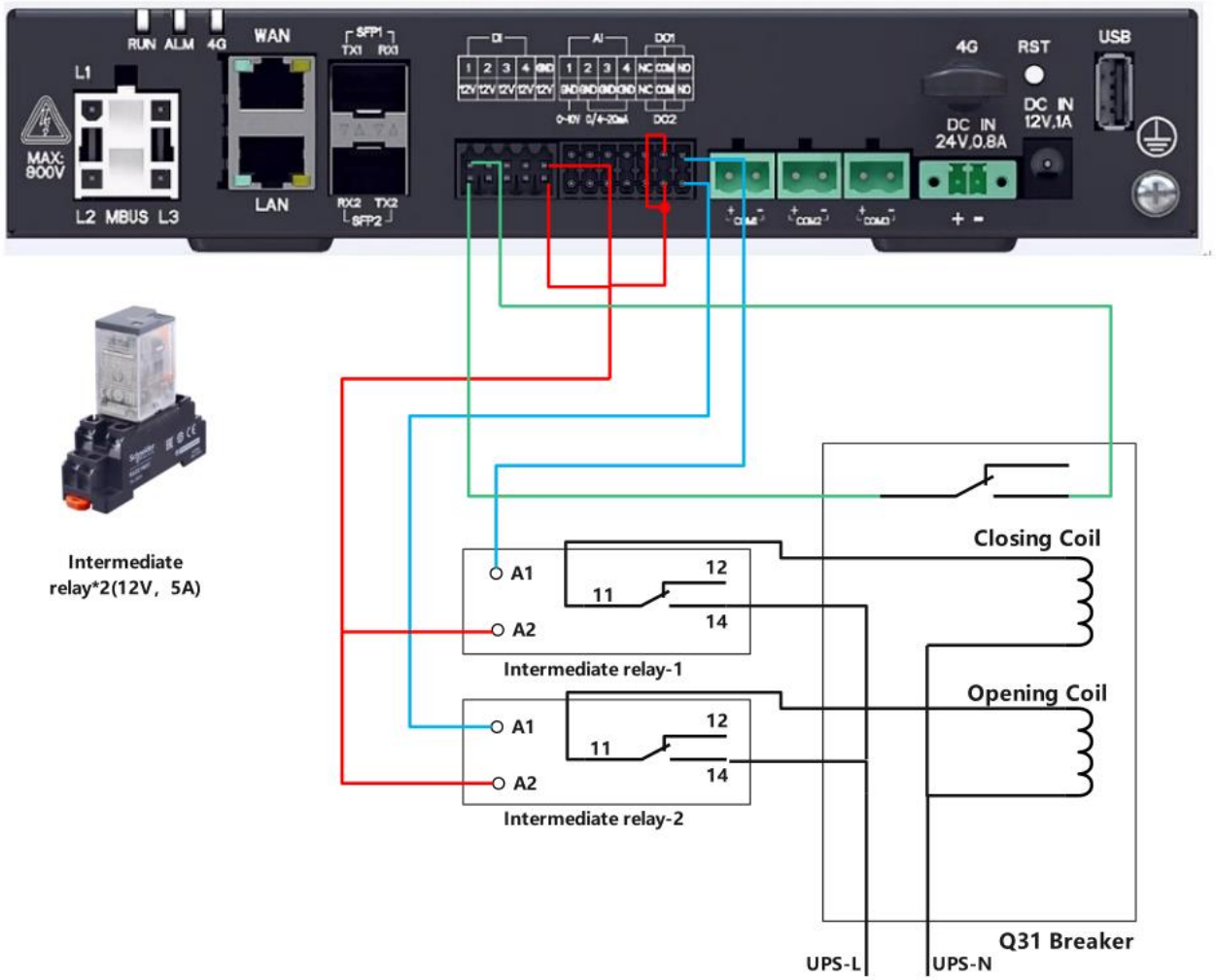
No.	Device	Model	Unit	Qty.	Supplier	Remarks
1	Smart String ESS	• LUNA2000-215-2S10	pcs	≤ 20	Huawei	
2	PV inverter	M3, V5/V5+, V6	pcs	≤ 30	Huawei	Optimizers are not supported in off-grid scenarios.
3	On/Off-grid controller/SmartLogger	SmartLogger3000+SmartModule	pcs	1	Huawei	For details about the configuration in China and other specific regions, see the configuration manual.
4	Management system	FusionSolar SmartPVMS	pcs	1	Huawei	
5	PDF	**Internal integration:** 1. Integrates **load switches** and supports remote I/O switch-on/off control. **2. UPS:** ≥ 1 kVA, online UPS, 220 V, backup time > 48 hours **3. AC input power distribution switch** for PV modules and ESSs 4. Space shall be reserved in the cabinet for installing the SmartLogger and SmartModule. 5. The cables from the inverter and battery to the PDC shall be at least 5 m long.	pcs	1	Third party	The UPS can sample devices with the power generation function, for example, devices connected to PV modules. The power backup duration shall be sufficient to support loads in the period from power outage at night to the next day when the irradiance recovers.

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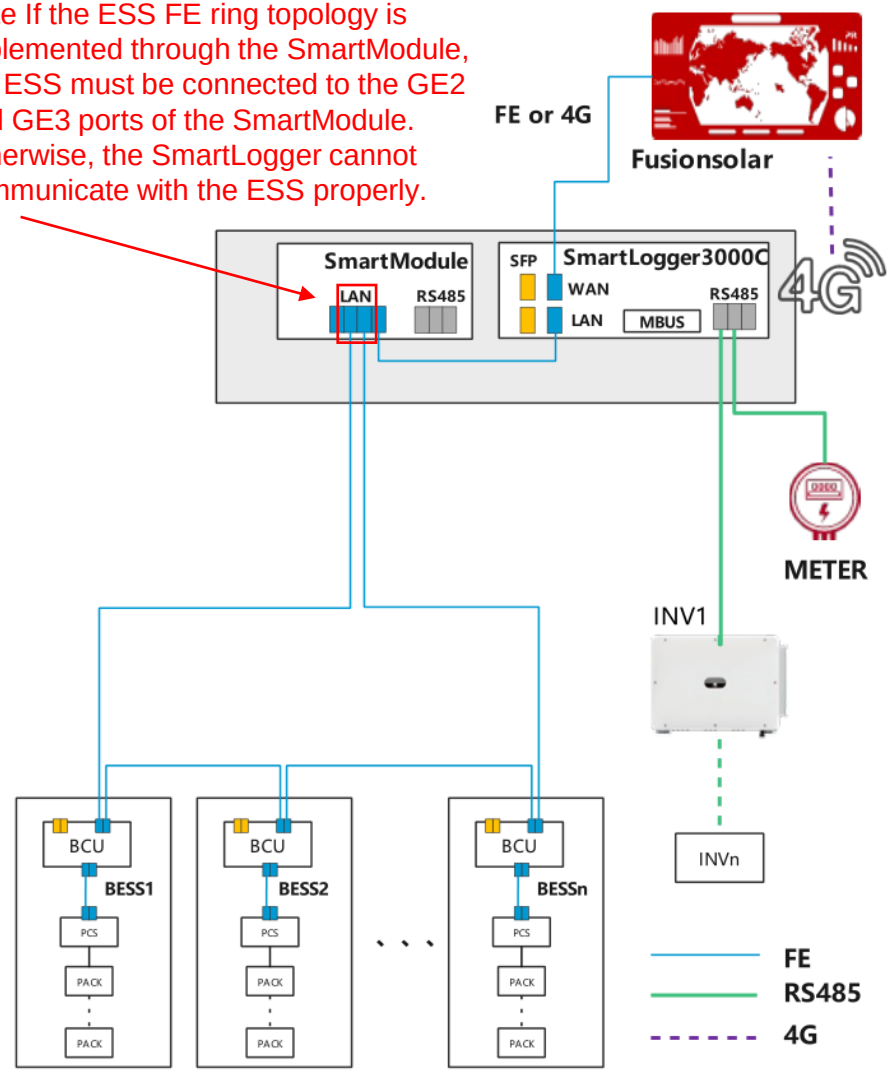
Electrical Networking Mode - Off-Grid Scenario



Communication Networking Mode - Off-Grid Scenario



Note If the ESS FE ring topology is implemented through the SmartModule, the ESS must be connected to the GE2 and GE3 ports of the SmartModule. Otherwise, the SmartLogger cannot communicate with the ESS properly.



The PV+ESS on/off-grid system can be networked using the SmartLogger and SmartModule. The restrictions are as follows:

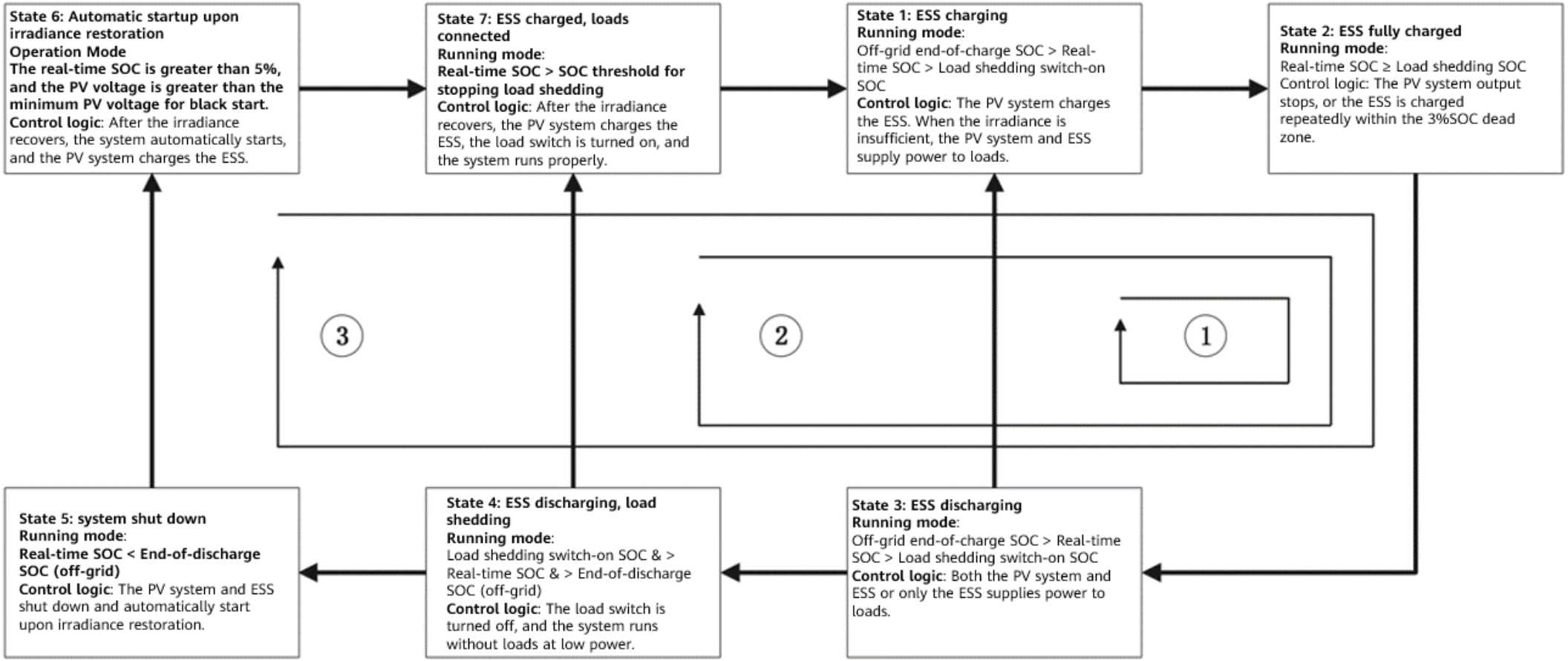
(1) The PV inverter and meter support RS485 communication networking.

(2) The ESS supports FE ring networking.

(3) The SmartLogger connects to the SmartPVMS over 4G.

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Control Logic - Off-Grid Scenario



Note:
Running logic 1: states 1 to 3;
running logic 2: states 1 to 4 and state 7;
running logic 3: states 1 to 7.

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Scenario Constraints

The constraints on the C&I on/off-grid scenario are as follows:

1. When the SmartLogger functions as the on/off-grid controller, it is not recommended that the SmartLogger send scheduling commands to northbound devices. Only the application scenario with a single grid connection point and a single SmartLogger is supported.

2. Only low-voltage coupling is supported. Medium-voltage coupling is not supported.

3. In off-grid scenarios, the PV-to-ESS ratio is less than 2:1, and optimizers cannot be configured.

4. The operating SOC of the ESS is between 10% and 90%. In the off-grid scenario, the operating SOC for the ESS to recover load carrying ranges from 20% to 90%.

5. ESSs of different specifications or models cannot be used together.

6. If a genset is available, it shall be connected to loads using an ATS.

7. UPS requirements: power ≥ 1 kVA, online UPS, 220 V AC, backup time ≥ 48 hours

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Communication Networking

In actual networking, select a networking mode based on the number of ESSs in the array and the SmartLogger model.

Note: Currently, the inverter **does not support the MBUS** communication mode .

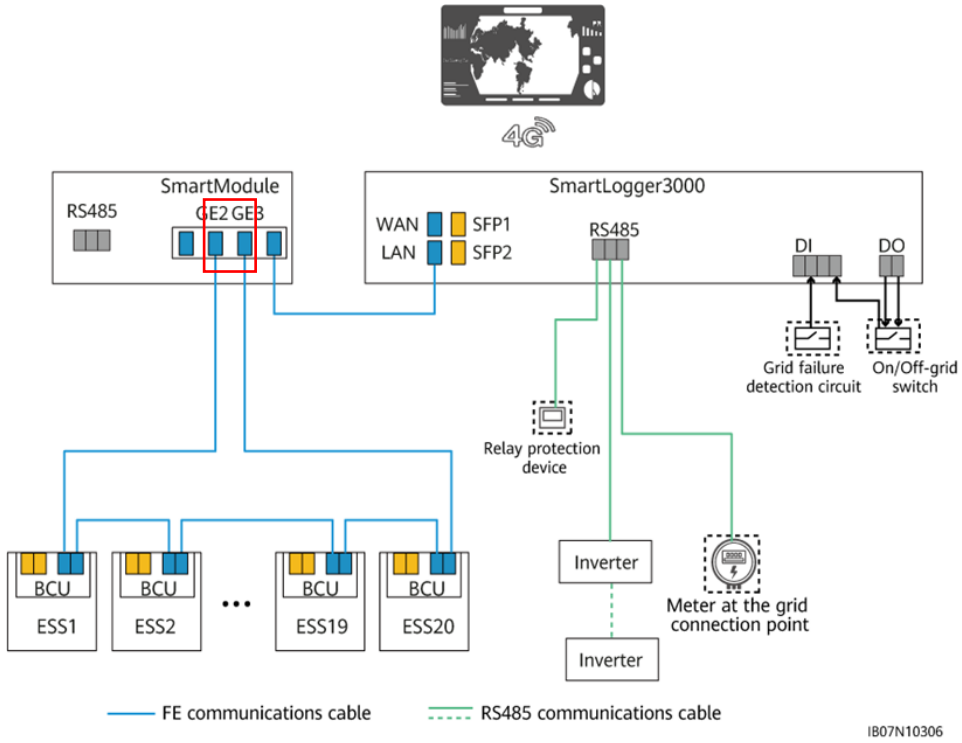
Maximum communication distance:

- RS485: 1000 m
- FE: 100 m

Typical scenario 1: SmartLogger+ESS FE ring networking

In this scenario, the SmartLogger3000 and SmartModule are configured.

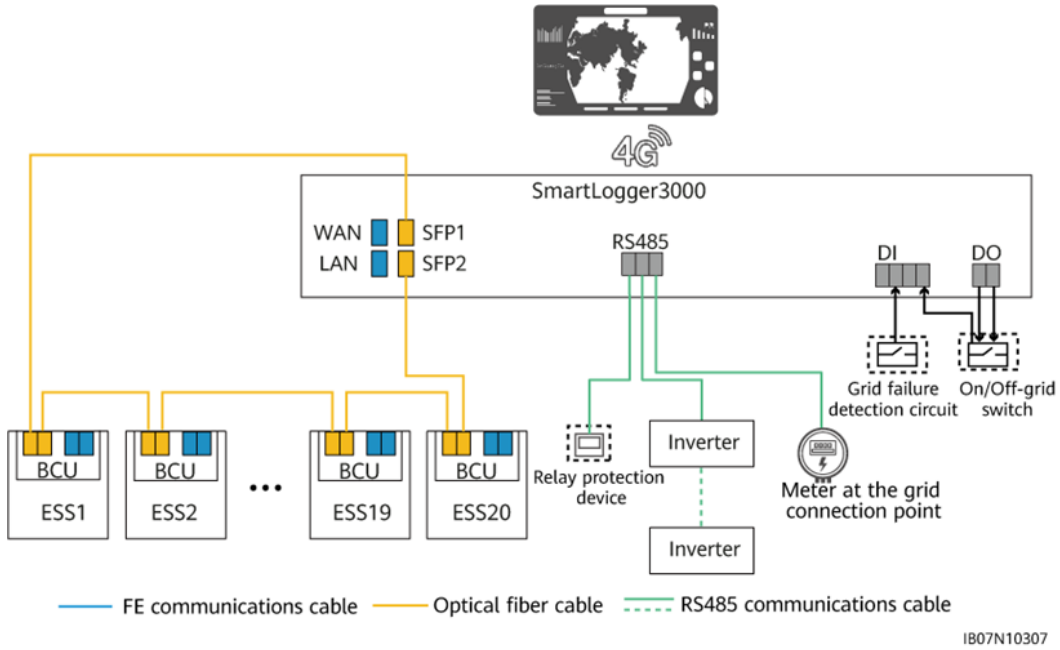
- A single FE ring network supports a maximum of 20 ESSs, and the distance between any two nodes is less than 100 m.
- One SmartLogger can connect to a maximum of 20 ESSs.



Typical scenario 2: SmartLogger+ESS fiber ring networking

In this scenario, the SmartLogger3000 is configured.

- One fiber ring network supports a maximum of 20 ESSs.
- One SmartLogger can connect to a maximum of 20 ESSs.



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Requirements for Main Third-Party Auxiliary Devices

Third-party UPS

In the C&I on/off-grid scenario, the UPS is in standard configuration. The UPS supplies power to the SmartLogger, BCU, universal relay, and on/off-grid switch/load switch.
When the system shuts down due to low electricity, the power supply is faulty, or on/off-grid switching is performed, the UPS supplies emergency power to the monitoring system and on/off-grid switch to support remote black-start of the on/off-grid system.

(1) Capacity > 1 kVA, online UPS
(2) Backup time: The backup time is greater than 48 hours in off-grid scenarios and greater than 1 hour in other scenarios.
(3) Output voltage: 220 V AC
(4) Power of devices in the supported UPS range: about 15 W for the SmartLogger, 100 W for each ESS, and 15 W for the universal relay
(5) UPS usage requirements: The UPS can run automatically and continuously with a long backup time. In the off-grid scenario, the hybrid power supply or the power supply devices of the same type can be used.

Third-party on/off-grid switch and load switch

In the C&I on/off-grid switching scenario, you need to set or specify the on/off-grid switch to ensure that there is a clear isolation breakpoint between the on/off-grid system and the power grid.
In the C&I off-grid scenario, the load switch needs to be set to perform load shedding.

(1) Automatic seamed on/off-grid switching: The switch supports remote switch-on and switch-off. A UPS is configured for the switch control loop to remotely control the switch when mains supply is lost. The switch status auxiliary contact is connected to the SmartLogger.
(2) Manual seamed on/off-grid switching: The switch status auxiliary contact is connected to the SmartLogger.
(3) Off-grid scenario: The load switch can be remotely turned on or off.

MCCB
(MCCB+electric operating device)



ACB



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