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# **GOODWE Capacity Extension Solution**

## BACKGROUND

In some regions and countries, stable power supply usually can be achieved. However, previous existing grid solar inverter system still need to be updated for some reasons such as stabilize the power supply and different application scenarios demand. To meet the requirements of capacity extension and energy storage at the same time, herein we provide a cost-effective solution which contains solar, hybrid inverter, Lithium-ion battery, smart meter, CT.

# SOLUTIONS

## Working mode

_	Self-consumption	Back-up	Time of use	Load monitoring	Export power limitation
Solution A <sup>*1</sup>	√	$\checkmark$	$\checkmark$	$\checkmark$	Depends*1
Solution B <sup>*1</sup>	√	$\checkmark$	$\checkmark$	Depends*1	Depends*1
Solution C <sup>*1</sup>	√	$\checkmark$	$\checkmark$	Depends*1	Depends*1

## Solution A: Single phase hybrid system retrofit single phase on-grid system



Hybrid inverter working mode	1. Self-consumption, 2. Back-up, 3. Time of use, 4. Load monitoring, 5. Export power limitation (depends).	
Required devices	Solar, Hybrid inverter (EH, ES, EM, ESA, EHB), Lithium-ion battery, GM 1000D	
Operation Logic	Solar power of the system will support loads first then charge battery, and the exceed power will be able to export to grid which could be limited. (Will export power limitation of the whole system realize or not depends on on-grid inverter has such functions)	
Load monitoring	GM1000D & CT #1 detect the power of the whole system, while GM1000D & CT #2 detects the power from on-grid inverter. Real-time consumption of loads can be calculated as following: P_load=P_on-grid inverter output + P_hybrid inverter output - P_grid (exporting) or P_load=P_on-grid inverter output + P_hybrid inverter output + P_grid (importing)	
Export power limitation	Export power limitation of the whole system depends on whether on-grid system can realize export power limitation. If on-grid system couldn't realize export power limitation, the hybrid system can only control the power of itself.	

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### Solution B: Three phase hybrid system retrofit three phase on-grid system

	Battery	
	Hybrid inverter working mode	1. Self-consumption, 2. Back-u power limitation (depends).
	Required devices	Solar, Hybrid inverter (ET), Lith
	Operation Logic	Solar power of the system wi power will be able to export to (Will load monitoring and exp depends on on-grid inverter ha
	Load monitoring	GM3000 & CTs detect the po data from on-grid inverter. Two 1) If the power from on-grid Real-time consumption of Ic P_load=P_on-grid in
		P_load=P_on-grid ir 1) If the power from on-grid Load monitoring cannot be
		Export power limitation deper or not. Two situations has bee 1) If the power from on-grid

Hybrid inverter working mode	1. Self-consumption, 2. Back-up, 3. Time of use, 4. Load monitoring (depends), 5. Export power limitation (depends).	
Required devices	Solar, Hybrid inverter (ET), Lithium-ion battery, GM 3000	
Operation Logic	Solar power of the system will support loads first then charge battery, and the exceed power will be able to export to grid which could be limited. (Will load monitoring and export power limitation of the whole system realize or not depends on on-grid inverter has such functions)	
Load monitoring	GM3000 & CTs detect the power of the whole system, however the system lacks the data from on-grid inverter. Two situations has been listed as following: 1) If the power from on-grid inverter is known: Real-time consumption of loads can be calculated as following: P_load=P_on-grid inverter output + P_hybrid inverter output - P_grid (exporting) or P_load=P_on-grid inverter output + P_hybrid inverter output + P_grid (importing) 1) If the power from on-grid inverter is unknown: Load monitoring cannot be realized.	
Export power limitation	<ul> <li>Export power limitation depends on whether on-grid system can control output power or not. Two situations has been listed as following:         <ol> <li>If the power from on-grid inverter is known and controllable: Export power limitation can be realized.</li> <li>If the power from on-grid inverter is not known and controllable: Export power limitation of the whole system cannot be realized. The system can only control the power of itself.</li> </ol> </li> </ul>	





#### Solution C: Single phase hybrid system retrofit three phase on-grid system

Hybrid inverter working mode	1. Self-consumption, 2. Back-up, 3. Time of use, 4. Load monitoring (depends), 5. Export power limitation (depends).	
Required devices	Solar, Hybrid inverter (EH, ES, EM, ESA, EHB), Lithium-ion battery, GM 3000	
Operation Logic	Solar power of the system will support loads first then charge battery, and the exceed power will be able to export to grid which could be limited. (Will load monitoring and export power limitation of the whole system realize or not depends on on-grid inverter has such functions)	
Load monitoring	<ul> <li>GM3000 &amp; CTs detect the power of the whole system, however the system lacks the data from on-grid inverter. Two situations has been listed as following:         <ol> <li>If the power from on-grid inverter is known:</li> <li>Real-time consumption of loads can be calculated as following:</li></ol></li></ul>	
Export power limitation		

\*1 : See detailed information below.