REACTIVE POWER COMPENSATION

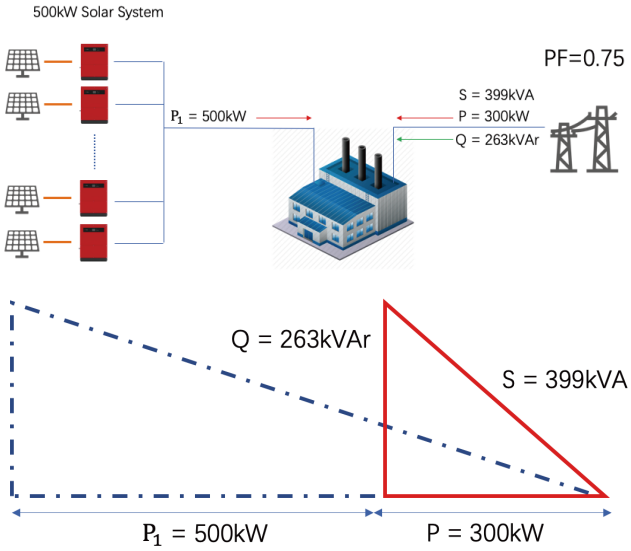
VER: 01, UPDATED ON NOVEMBER 15TH, 2019

Influence of PV Systems on Overall Power Factor

Most grid connected PV inverters only produce active power as default to supply the loads directly. As a result, the grid is supplying less active power, but the same amount of reactive power, this will reduce the power factor of the whole system. That is why the reactive power compensation function is becoming more necessary.

To better understand the influence, we take a factory in China for example:

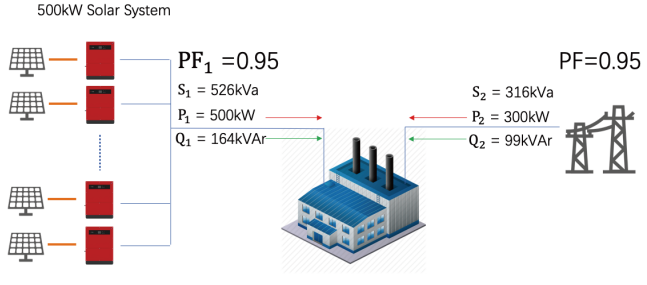
This factory consumes 800kW of active power (P), 263kVar of reactive power (Q), and the power factor (PF) is at 0.95, which conforms to the requirement of the grid company.
If a 500kW PV system is installed, under optimum situation, there could be 500kW active power(P_1) from the PV system directly to supply the loads. Thus, the active power drawn from the grid would be reduced to 300kW, while the reactive power drawn from the grid remains same, in this case 263kVar. According the electrical triangle, this leads to the PF to be reduced from 0.95 to 0.77, which does not meet the lower limitation in most countries and would result in some penalty from the grid company.

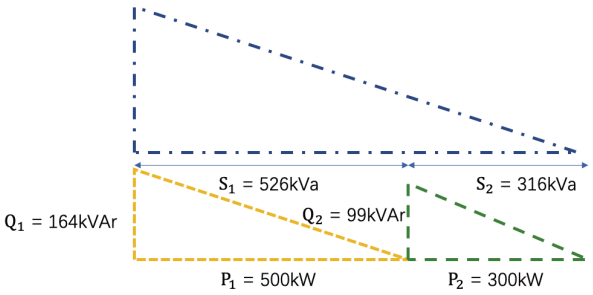


GoodWe Reactive Power Compensation Solution

Solution 1. Static Reactive Power Compensation

To avoid lower PF than as required and to make the overall PF value back to 0.95, the PV system as mentioned in above example needs to produce at least 164kVar reactive power (Q_1)to compensate. A simple way is to set a fixed value of reactive output power or to change the PF into certain value on inverter.





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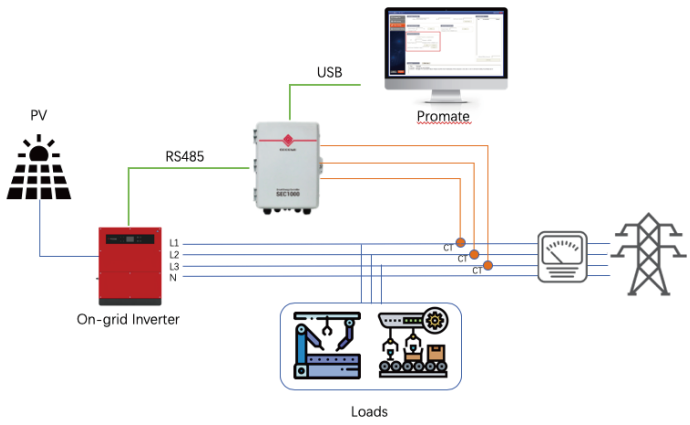
Solution 2. Dynamic Reactive Power Compensation

Static reactive power compensation is a good option especially when the loads always consume same amount of active power and same amount of reactive power. However, in more cases consumption of active and reactive power and PV generation are dynamic. Therefore, dynamic reactive power compensation with SEC1000 is an optimum option.

Name	SEC1000(Smart Energy Controller 1000)
Technology parameter	
Input voltage range	Phase voltage:AC 60V~280V
Input voltage frequencey	50Hz/60Hz
Input current range	0~5A
Rated power consumption	<10W
Communication with the inverter	RS485
Maximum distance from the inverter	1000m(shielded twiste-pair cable)
Maximum number of inverters connected	60pcs
Communication with terminals	LAN
Level of protection	IP65



System Wiring

Note: Proper CT should be selected according to the max possible AC current flowing through it.

The diagram above explains how it works:

1.Set a targeting overall PF value to SEC1000 through ProMate;

2.The CTs connected at AC side transmit the real-time current;

3.The SEC1000 calculates the required PF value and the reactive power for the solar inverters and sends commands to all inverters to set the same PF value, asking them to generate corresponding amount of reactive power.

As the overall PF value keeps changing, the SEC1000 will keep adjusting PF value for all the inverters.

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System Commissioning

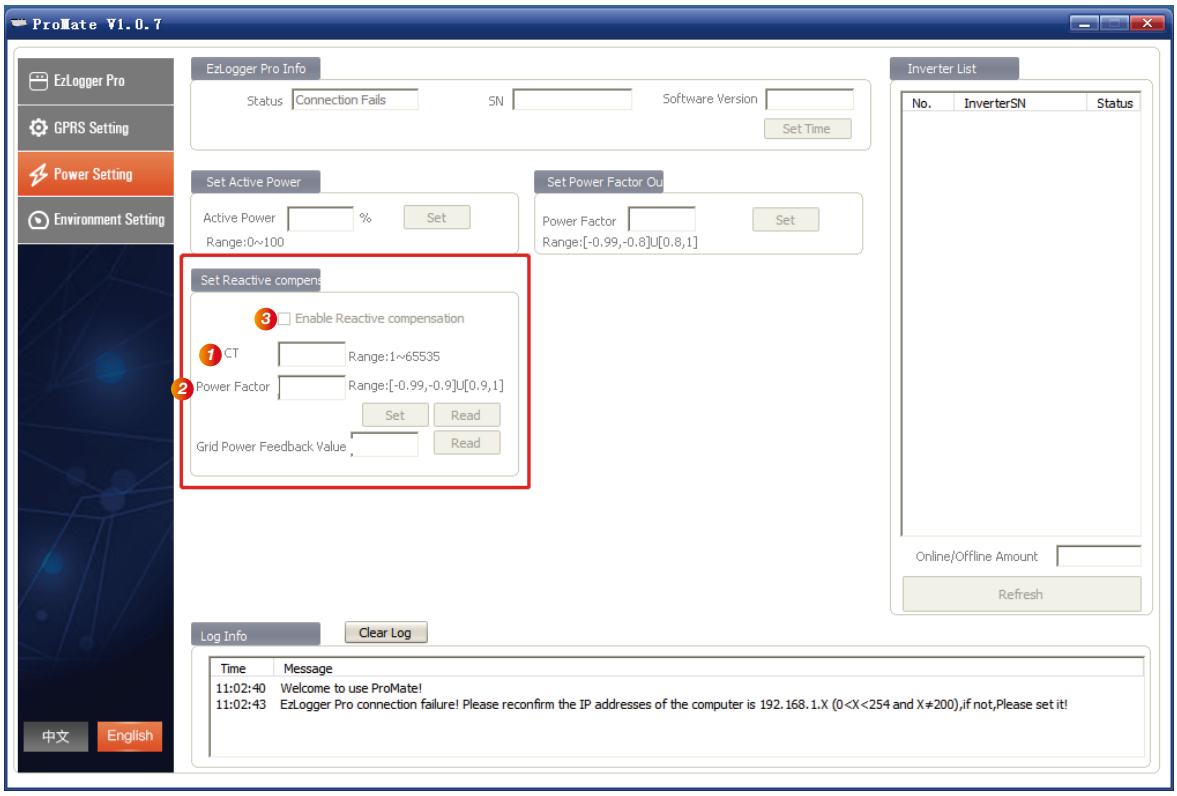
To realize the reactive power compensation, we need to do the following three steps on ProMate:

1.Set the variable ratio of external CT (note that the corresponding secondary current value does not exceed 5A);

2.Set the desired Power Factor value;

3.Enable Reactive compensation;

The Grid Power Feedback value is the actual value acquired after setting the expected Power Factor.



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