

BACK FEED MANAGEMENT FOR SOLAR POWER PLANT



DRS ENERGY

FROM TEAM DRS



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PRODUCT INTRODUCTION

Most of the EPC companies face challenges when Power from Solar Power Plant flows to Diesel Generator as it harms the alternator, or sometimes results in mechanical damage. It can also increase the bill of the customer (where net metering is not available or is not allowed)

DRS has a field-proven solution, Sol.SYNC, which prevents backflow of solar power to a diesel generator.

This also works equally well on Grid Export where for example:

1. Grid where net metering is not possible or available,
2. Grid export is not needed by end client,
3. Grid export is disallowed by Discom,
4. Grid export is allowed, but only during certain Time Of Day,
5. Grid export is allowed, but limited to certain kWhr / MWhr per day.

The conditions for Solar DG Sync arise when the load drops to less than Power Produced by Solar Power Plant [e.g. on Saturday, Sundays and other holidays]. This could also happen during the normal day when the load is less than power produced by the solar power plant (like during lunchtime or during shift change or immediately after a power source change over).

Every few millisecond **Sol.SYNC** can do the following -

- Monitors Power demands of local load(s) on the existing Electrical Control Panel. [Sometimes it is too complicated to collect this data, due to preexisting Electrical Power Panel design. So instead of collecting load data, DG / Grid power data is collected, bidirectionally. Though not as effective as the first method, it is well within the prescribed limits of electrical power flow and protection parameters]

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- Monitors Power being produced currently by Solar Power Plant.
- Calculates if Power Produced currently is greater than Current Power Demand for Local Loads
- Commands Solar Power Plant to produce power equal to the local demand
- Can, optionally, give control command to switch On fixed, normally non-essential, loads to consume power, reducing the wastage of Solar power.

In addition to this, **Sol.SYNC** can, optionally, perform the grid reverse-power protection by controlling the power output to temporarily isolate the Solar Power Plant, if it has such a feature available, else, of course, there are other resources like tripping the Solar Power inverter, simultaneously or one by one (depending on the model of chosen).

PRODUCT FEATURES

- Proportionally Controls and prevents solar export from PV inverters, if and when needed,
- Accuracy of +/- 5%,
- Works with for most of the reputed Solar Inverters Manufacturers like, SMA, Schneider, ABB, Delta, Kaco, etc.
- Can be used for multiple Inverters simultaneously
- Detects and controls excess solar power available.
- Electrically Isolated Communication connection to PV Inverters.
- RAMP up / down the Solar Power production depending on need on real time basis.
- Data Logging, with Cloud, is available as an built in feature,

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- **Add On Options Available with Sol.SYNC :**
- **Optional:** Surge Protection can be provided, and is suggested, for communication Port and power input of Inverter(s) to protect solar inverters, if not available already.
- **Optional:** AC contactor output for controlling reverse-power protection contactor. However, this is needed, only if an emergency shutdown is not available in the solar inverter.
- **Optional:** Switching On non-essential fixed loads if excess solar power is available.
- **Optional:** Inverter Cutoff for much faster control on prevention of Solar Power Feedback into DG/Grid. However, this is possible, only if an emergency shutdown is available in the solar inverter.

APPLICATION FEATURES

- **Sol.SYNC** does DG Solar Synchronizing. It helps to run DG at a minimum of 30% load, in line with recommended by the DG set manufacturer.
- **Sol.SYNC** prevents the export of solar power to DG and/or Grid, ensuring solar power is used within premises.
- **Sol.SYNC** can also do a T.O.D. export prevention/enablement to Grid if so required.
- **Sol.SYNC** helps to protect a DG against any back feed current, which could seriously damage the alternator or even the generator.
- **Sol.SYNC** is not restricted by the number of inverter or DG or distance between them. In case number of DG / Inverter is high, a suitable number of plug-in cards can be added to the system.

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For Best Results from Sol.SYNC

- Use Solar Inverters enabled with Communication thru Ethernet
- Use Ethernet Switches, when distances are greater than 70 meters,
- Use Fiber Optic Cable where lengths are higher than 1000 meters,
- If Ethernet Communication Port is not available,
- Serial communication port of the inverter will be needed,
- Use Repeaters in case cabling distances are greater than 400 meters,
- Use only good quality manufacturers for communication cable, like Belden / Lapp / Helukabel etc, for best results, consistently over time,
- Make sure separate

TECHNICAL DESCRIPTION

IP Protection Class - IP54/IP65	Enclosure Material - Sheet Steel (powder coated) / Polycarbonate (Transparent)
Environmental conditions- 0°C to 45°C & 5% to 95% R.H	Mounting Location - Indoors
Installations Options - Wall mounting	Power Interface - Phases: 1 / 3
Control Voltage Range - 200-270V AC; 50/60Hz	Power Range - 5kW to 5 MW.
Measurement Accuracy - $\leq 2\%$	Power Consumption - Max 10W to 100 W
Power Supply - Phase A	Communication - RS485 / Ethernet (Depending on Model)
Maximum Inverters at one Sol.SYNC	30 No's
Ramp up/ramp down - Isolated digital output	Aux Load Control Output - 240 VAC 1A / 24 VDC 1A
HMI, 5.7 Inch in select models	PC based software available optionally

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SOL.SYNC MODELS

We have 07 models of Sol.SYNC which can support up to 30 Inverters and all of them have the following features: -

1. Prevention of Export of Surplus Power to DG
2. Prevention of Export of Surplus Power to Grid
3. Prevention of Export of Surplus Power to Grid and DG
4. DG runs 30 to 40 % as per recommended by DG manufacturer
5. Number of Inverters supported by our device varies from 01 to 30 inverters
6. Adding of load step by step to avoid back feed into DG
7. Display on HMI PC Based Software is available from 10 inverters onwards.
8. Accuracy of our controller is $\leq 5\%$
9. Switching non-essential loads if excess solar power is available
10. Data Logging / Remote Monitoring is optional
11. Warranty is one year. An option of 5 years warranty is available on request

WHY IS IT REQUIRED?

The usual reasons where the Self-Consumption application is required by utility or energy distributor

1. The Solar Power Plant Owner does not have a Power Purchase Agreement (PPA) or Net Excess Feed-In Tariff (FiT is also called Net Metering) from Energy Distributor
2. The Solar Power Plant Owner is not allowed to export excess PV energy to the grid because the Energy Retailer is not obliged by law to provide revenue to the Asset Owner for the unused PV energy.

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3. Grid Voltage is too high due to saturated grid-tied solar systems in the area PV Inverter increases AC Output Voltage to export solar energy. Due to large solar penetration in the network and the fact most Grid-Connected PV Inverters are transformerless, it will cause the grid voltage to increase along the distribution line resulting in large voltage fluctuations.

4. High Penetration of Solar Energy which introduces Reverse Power flow that could disrupt Distribution Network Assets This could lead to increased short-circuit currents, fault level, affecting protection coordination and sensitivity, and the introduction of harmonics and transients.

5. Local site's existing LV/MV Transformer has reached its capacity When PV System is connected to Shared LV Circuit or Dedicated LV Circuit that utilized Shared Transformer with other Load, the capacity of Transformer may be reached and hence Export Limiting Control may be required to avoid upgrading Local Existing Transformer

6. Energy Distributor only allows a certain amount of Energy to be fed into its distribution system to ensure grid stability or allows a discrete (or full) amount of energy feed-in at certain times of day or week or month.

7. In absence of Grid Power, the supply is made by on-site, local backup power units like turbines and or diesel generators which do not allow reverse power flow.

8. One wants to contribute to the environment by utilizing Solar Power to the maximum.

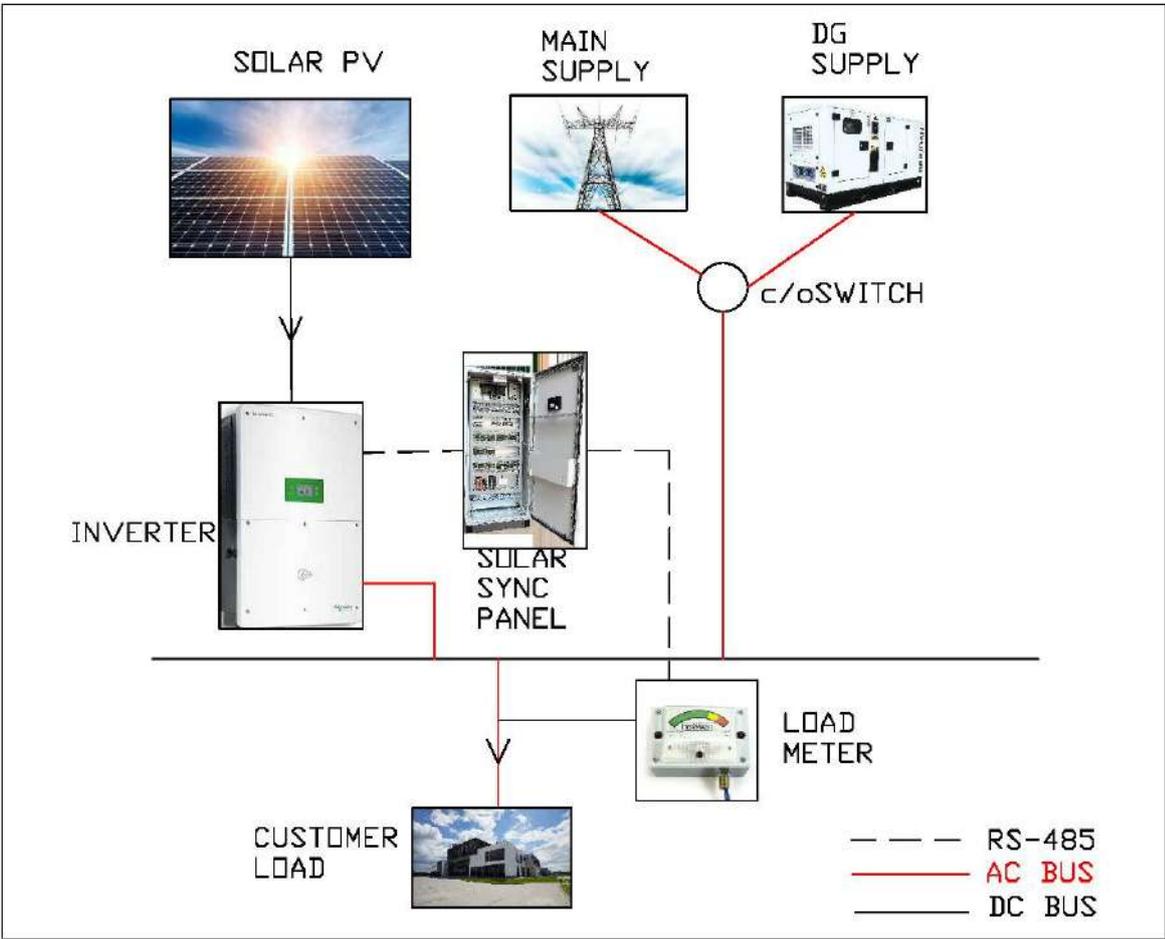
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TYPICAL SoI.SYNC LAYOUT



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VARIOUS BACK FEED MANAGEMENT SCENAIRIOS

Situation	Solar Power 200kW	Grid Power 200kW	DG Power 200kW	Customer Load	Managed Power
1	100	100	Off	200	Nil
2	50	150	Off	200	Nil
3	100	0	Off	50	50
4	150	50	Off	200	Nil
5	100	Off	100	200	Nil
6	50	Off	150	200	Nil
7	100	Off	70	50	120
8	150	Off	70	200	20

INFORMATION NEEDED TO CONFIGURE SOL.SYNC

- Number of Inverters needed to be sleeved
- Make & model number of Inverters needed to be sleeved
- Number of DG's / transformers to be protected from reverse power
- Number of load Side outgoings needed to be monitored
- Single line diagram of power distribution panel where solar power output is to be connected.

CHALLENGES USING SOL.SYNC (OR ANY OTHER DG SYNCH SOLUTIONS)

While this is a very straightforward, time-tested product, but we have to ensure the product is properly evaluated during the site survey, during product design and while software programming some of the main consideration that has to be taken into account for successful installation are:

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Distances

- Between the Solar Inverters themselves (eg they may be located on different buildings within the same site),
- Between the Solar Inverters and Sol.SYNC Panel,
- Between Sol.SYNC Panel and DG Panel(s),
- Between DG Panels and Solar Inverters, Distances have a major impact in hardware selection e.g.

If the distance is less than 300 meters, we can use serial communication protocols,

If the distance is between 300 meters and 600 meters we can use serial communication protocols, but with repeaters,

If the distance is higher than 800 meters, we prefer to go with fibre optic cables,

Make and model of Inverters

- While most inverters allow communication of third-party devices like Sol.SYNC with the Solar Inverters, some do not (at least not till they make you buy some communication interface)
- Most Solar Inverters have Serial Communication Interface, but some do have Ethernet Interface and it impacts various selection,
- Most solar inverters have only one communication port. While some of the better models have two communication ports. The one with two communication ports offers no problem since one can be used for RMS and other for Solar Backfeed Management. But the inverters with only one communication port will either be able to allow RMS to function or the Solar Backfeed Management to access the control system. However, we do have a workaround solution to this which we can share once the make and model of RMS are shared with us.

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SOL.SYNC SOLUTION DOES NOT COVER THE FOLLOWING

- Single phase self-consumption applications for grid connect PV Storage system with only DC coupling using MPPT Solar Charge Controller
- Three phase self-consumption applications for grid-connected PV Storage system
- Off Grid Standalone PV Storage system
- Backup Power application
- Energy and Load Management application
- Microgrid PV systems installed and act as providing a spinning reserve to Generator