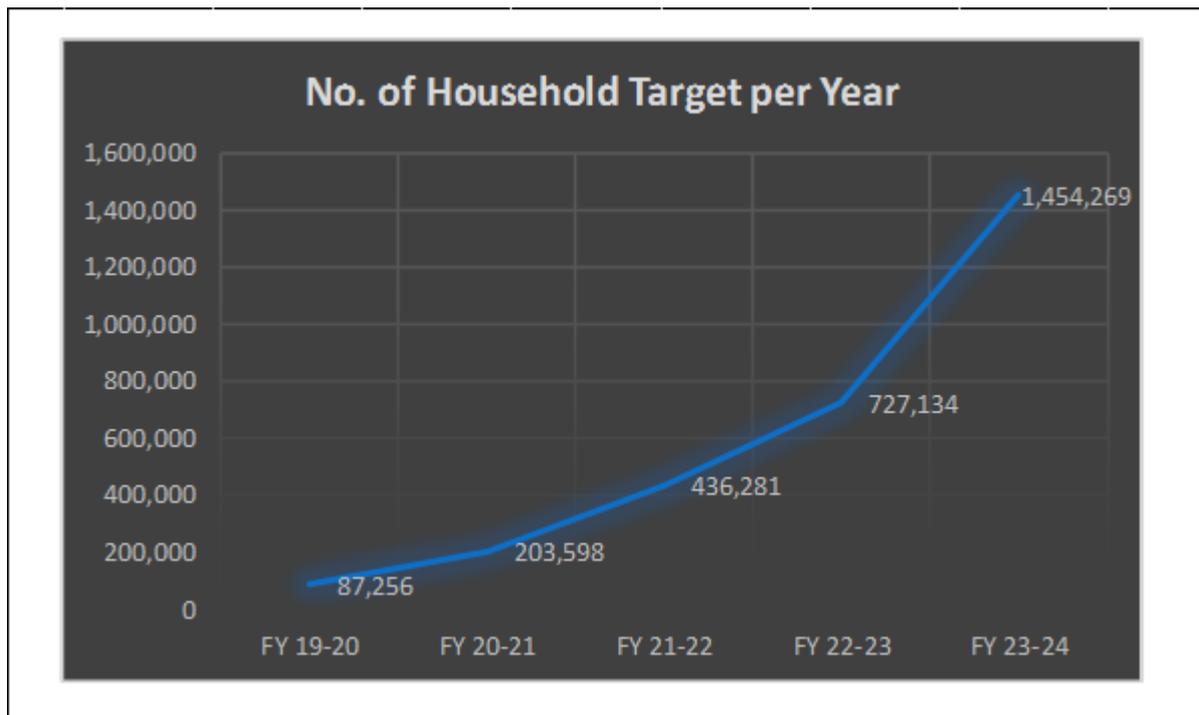


PV Port & Store

PV Port & Store is a standardized, portable, mass produced 2 kWp PV system with electrical storage for residential applications designed by GIZ – Deutsche Gesellschaft für internationale Zusammenarbeit – on behalf of the Ministry of New and Renewable Energy, Delhi, India.

Target Audience and Dissemination

- ⇒ 1.5% of the 5 GW GoI Target by 2022 with a share of PV Port
- ⇒ 80 DISCOMS across India targeting residential customers



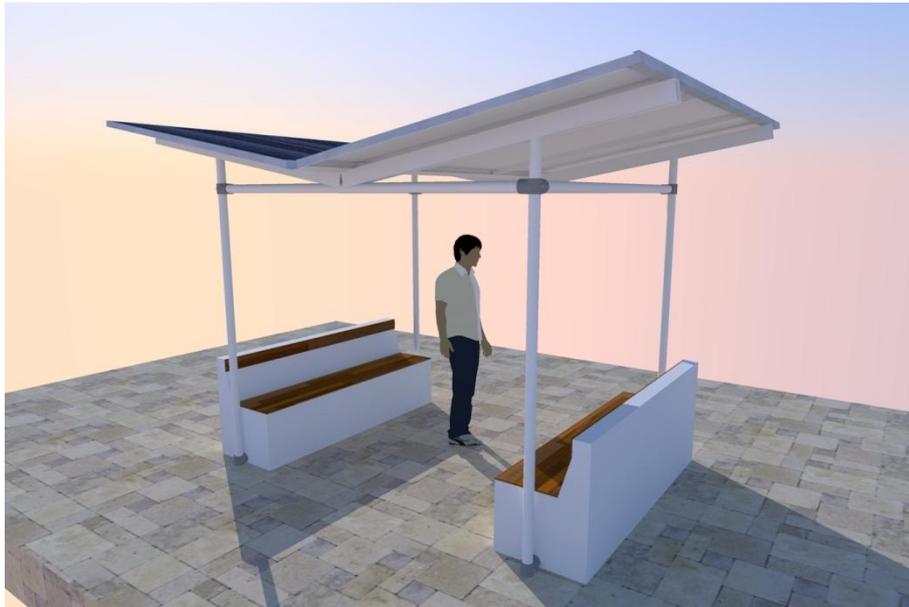
- Retail through direct selling
- RESCO / ESCO Model through Aggregator (EESL or SECI)
- Lease Model through EPC Solar companies

Why PV Port & Store in India?

- Flat, concrete Roofs – no snow
- Mature Power Backup (UPS) – sector power outages are common
- Dual Wiring – critical load / heavy loads
- One AC / household is becoming a standard – 4-6 kWh/night
- Tariffs design based on slabs – bucket filling method
- Energy Demand will increase factor 5 by 2030

Mechanical structure

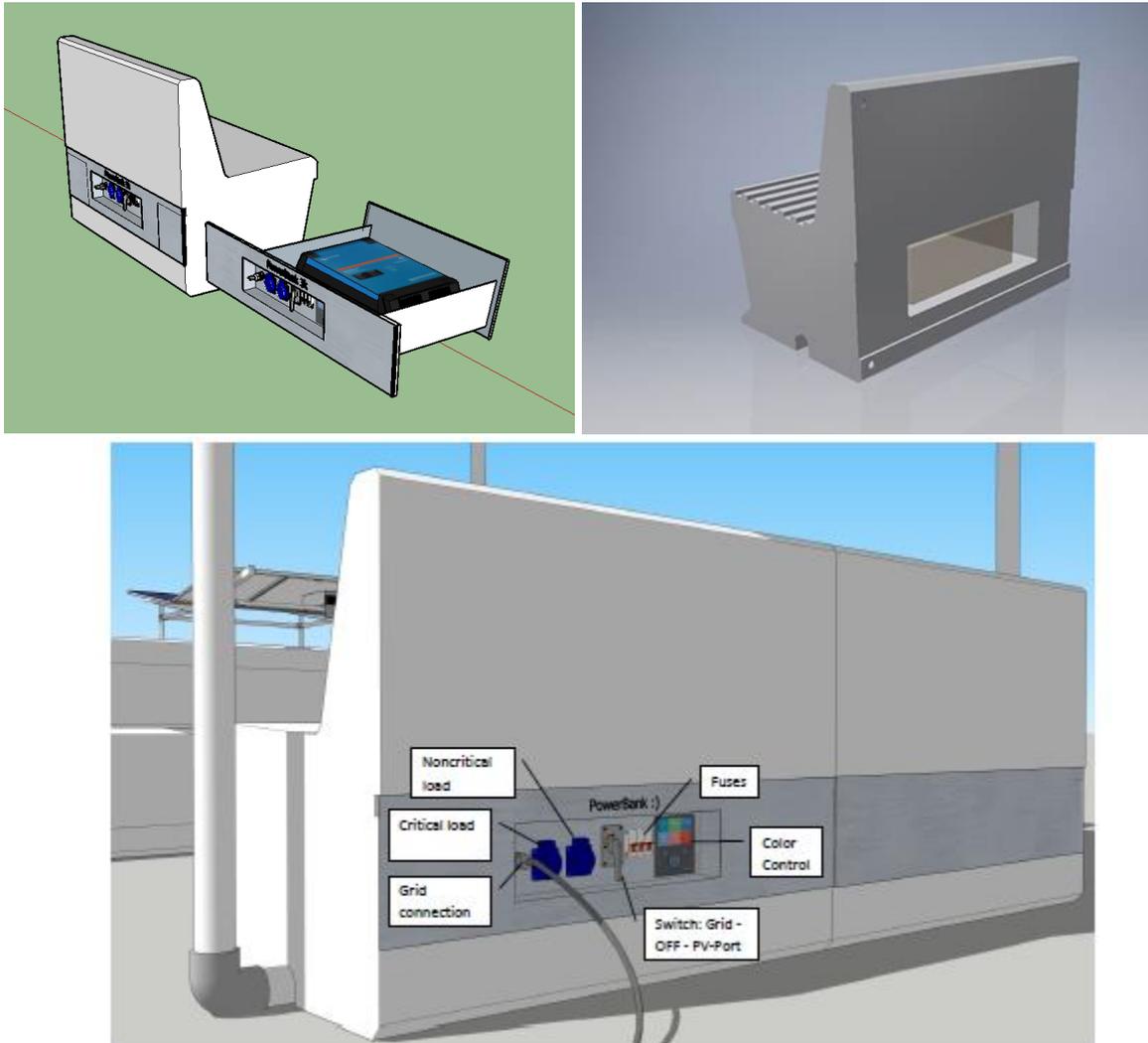
- Self - ballasting structure; No puncture in the roof
- Based on CFD and solar yield simulations, the optimized east-west orientation of the modules has enabled the design to resist wind load conditions defined by Indian Standard Codal requirements (IS875 Part 3) for basic wind speed of 50m/s considering flat terrain for installation on top of buildings with up to 12m height (4 stories). The design also resists to the load at wind speeds of 55m/s including Venturi effects at 1 m from the terrace edge. (*Certificate available*)



Rotomoulded Bench

One of the two benches contains all the electronics, inverter, batteries in a cavity which is surrounded by water. This bench comes pre-assembled with all the electronics from the factory. The other bench cavities offer room for the installation of batteries with potential future capacity increase. The water in both the benches is filled on site, allowing easy transport. The advantages of the water filled benches are two folds:

1. The weight of the bench is substantially increased with water and thus acts as counter-weight to all the uplift force which may be caused due to wind
2. The water surrounding the electronics acts as a fluid cooled heat sink and thermal buffer which improves efficiency and keeps batteries within the permitted temperature range for their 10 year warranty conditions.



Functionalities

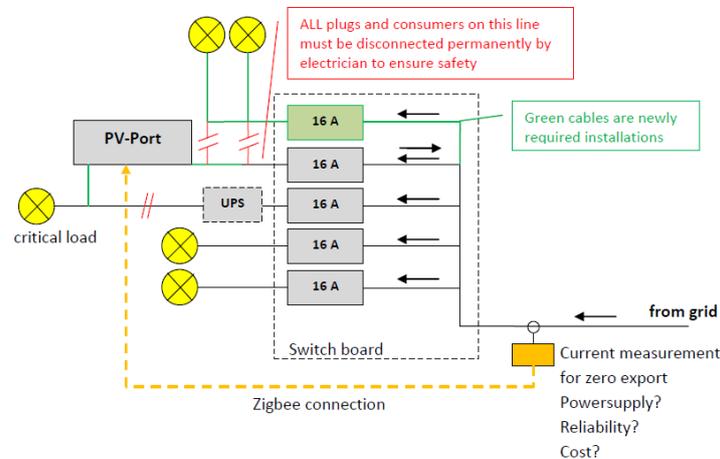
PV Port & store is a hybrid system that provides the following functionalities

1. **In parallel to the grid:** All loads are supplied from the PV Port & Store. In case load is more than PV output, the electricity is imported from the grid.
2. **During power outage:** The PV Port & Store supplies electricity from the PV modules and the batteries to the critical load during grid outages (similar to a conventional UPS system).
3. **No export to the Grid:** PV Port & Store shall not export anything to the grid after the Discom meter. There is no need to change the existing meter.
4. **Peak shaving:** A user can participate in the Time of Day tariff, demand side management schemes of the distribution companies to support them in peak shaving and taking the benefits of the schemes.

Connection to the house

PV Port & Store has two outputs a) for supplying to the non-critical load and b) for supplying to the critical load. There are several ways to connect PV Port & Store in the house however the recommended connection is to use a dedicated 16 A MCB at the distribution box. This eliminates any

chances of MCB blinding and thus is safe to be used. For the zero export functionality, a current sensor is placed at the incoming to the distribution box and which is communicating to the inverter using a wireless zigbee connection. In case zigbee signals are not reliable, an alternative wired communication cable can also be used.



Connection at the distribution box using dedicated MCB

Sprinkler system

PV Port & Store comes with a sprinkler system which can be used to sprinkler water. It can be with both automatic / manual modes. The system can also provide alarms to the user every week or so to clean the system.

Monitoring and Communication

Monitoring is done via the inverter and a cheap communication method is being worked out. An APP is currently being developed which will enable the user to download the data from the inverter using the smartphone as a hotspot (no wifi, no GSM is required) and using the network of the mobile phone, the data is communicated to a central server which is populating the data on a web portal (PV Port Portal). This method is eliminating the reoccurring cost of any dedicated GSM connection for the inverter and lack of wifi signals on the roof. Where good Wifi connection is available, it will be used for constant monitoring.

PV Port Portal

A web portal is currently under development which allows user to do the following things:

1. Qualify themselves to be eligible for a PV Port & Store (space requirements, electrical requirements, accessibility to the roof etc)
2. It contains all the information about PV Port & Store which a consumer would like to know before buying the system (Specifications, marketing material etc)
3. It allows the consumer to place an order and track it's shipment
4. The consumer can access all user manuals, installation videos, invoicing etc on the portal itself.
5. It can register the PV Port & Store on the portal and communicate the data from the inverter using point to point communication.

Cost of the system

The retail cost for the systems made through GIZ is achieved to be INR 150,000 – 240,000 depending on the choice of battery type and capacity. We expect a significant reduction in prices once the system is tendered in the scale of thousands and Central as well as State subsidies are utilized. The following is the breakup of the costs.

PV-Port cost estimate 12/2018			
	INR	INR	INR
	with Li-on (4.8kWh)	With Lead acid 2.4kWh	with Li-on (2.4kWh)
Electronics			
Victron MultiPlus-II 48/3000/35-32 230V inverter (1700 - 6000 Wp)	41,626	41,626	41,626
BlueSolar MPPT 150/35	10,603	10,603	10,603
Zigbee current sensor	4,200	4,200	4,200
Venus GX on RaspPi, Zigbee receiver	3,500	3,500	3,500
16A, 220Vac outdoor Cable, 10m + plugs	1,050	1,050	1,050
DC cables+ MC4 connectors	700	700	700
Battery (options)			
Solar lead acid battery, India made, 12V, 200Ah, 5 years warranty		18,732	
2 x 48V 50 Ah Lithium Iron Phosphate batteries (2 x 48 x 50 = 4.8 kWh)	100,000		
1 x 48V 50 Ah Lithium Iron Phosphate batteries (2 x 48 x 50 = 4.8 kWh)			60,000
PV-Panels			
6 x Glass Glass PV modules with frame (325 x 6 = 1950 Wp)	38,220	38,220	38,220
Structure			

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Disclaimer

The concept of PV Port & Store is developed under the Indo-German Technical Cooperation projects aimed at promotion of solar energy and is implemented jointly by Ministry of New and Renewable Energy and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

The concept is developed by the experts from GIZ and the private sector based on their best knowledge. Notwithstanding of detailed and diligent analysis no warranties for the results can be given. GIZ is giving this concept, report and results, info and recommendations included without guarantees. No responsibility is taken for the correctness of this information.