

Small/medium AC solar home Systems: preconceived ideas, benefits and limits

AC Solar home (individual) system topologies

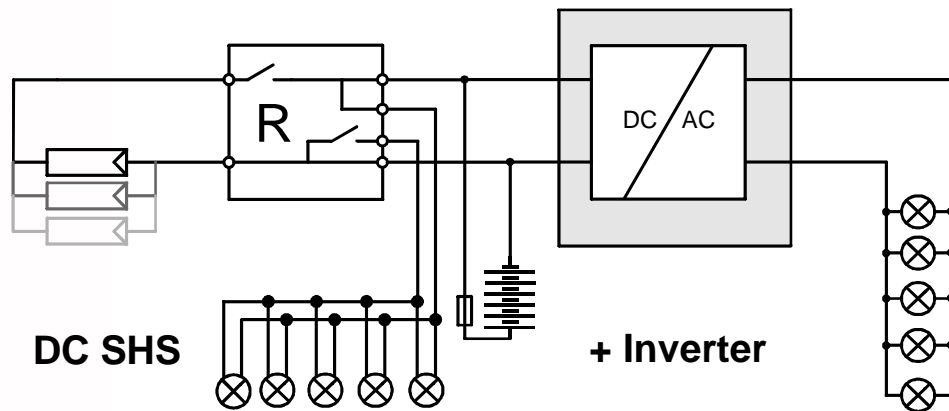
Some prejudices about AC SHS

- Poor efficiency
- More expensive
- Hazardous for people
- Harmful for battery life

Criteria to select between AC or DC system

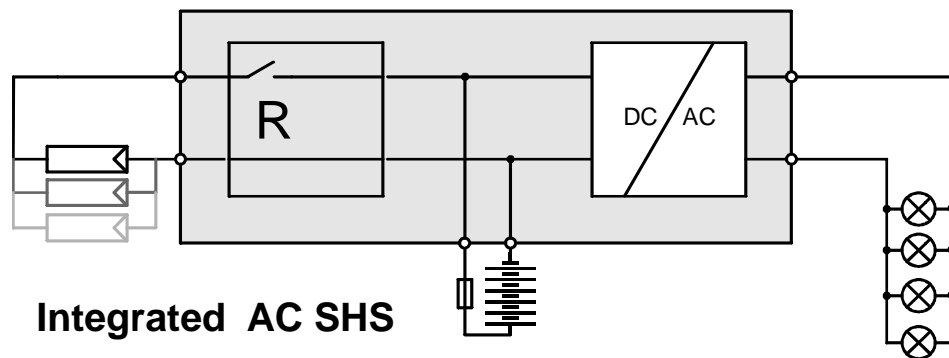
Some of other benefit of AC SHS

Solar home system topologies

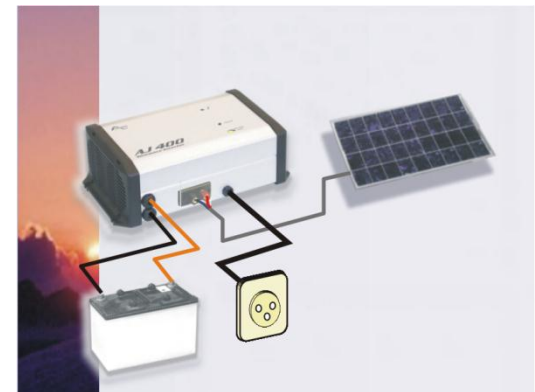


Mixed AC/DC SHS:

- More complex/mixed network
- Commonly poor quality inverter
- Uncontrolled LVD on AC
- Poor overall efficiency
- Not cost effective over the lifetime



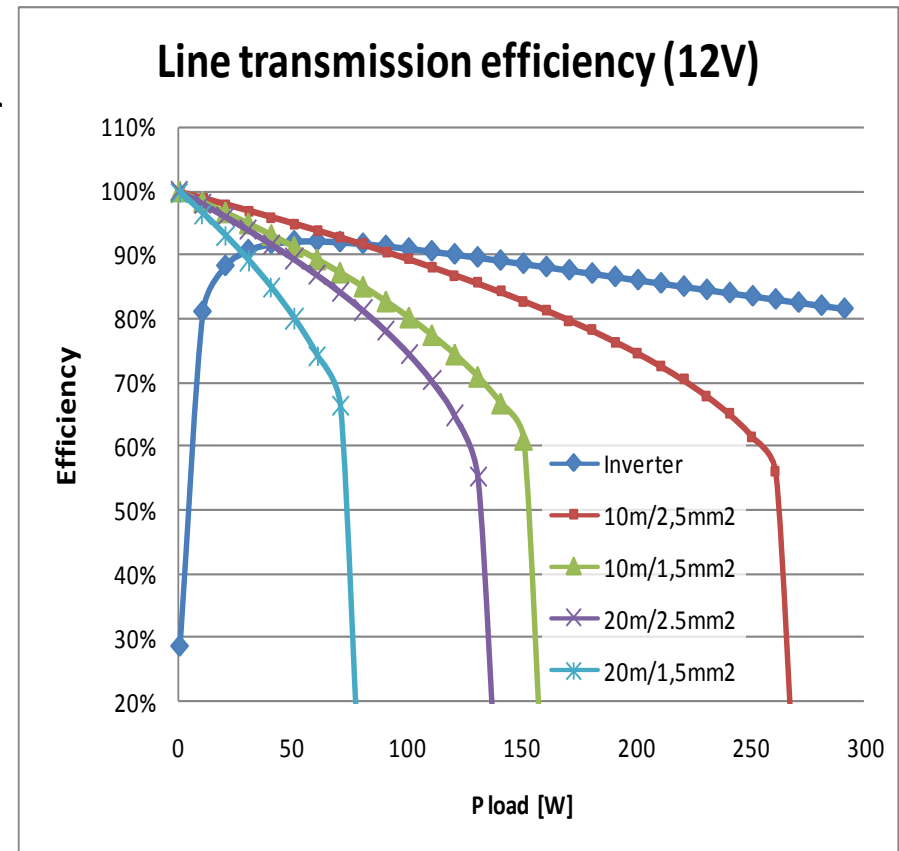
Simple AC SHS



Efficiency in DC SHS

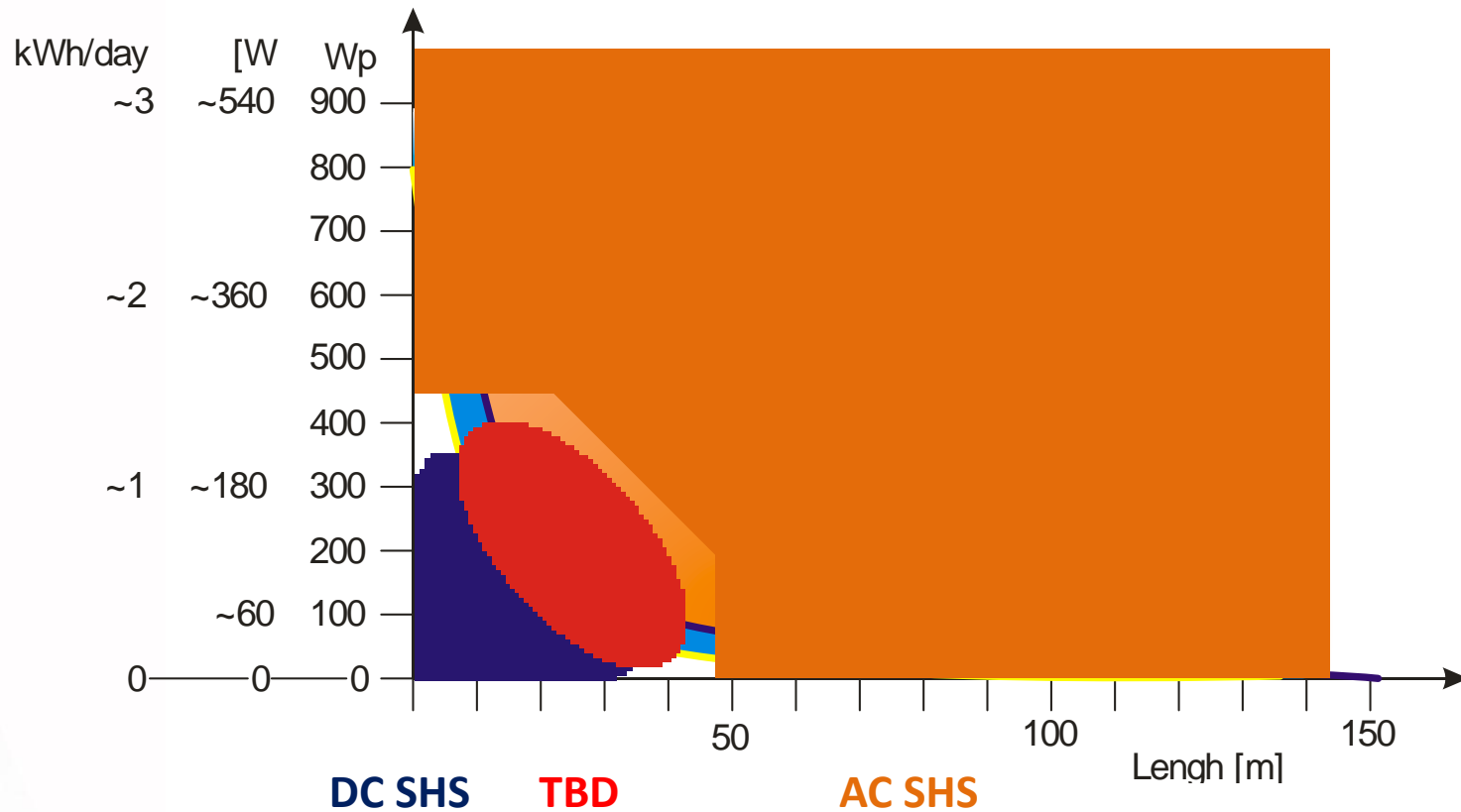
Usually negligible losses in the regulator ($> 1\%$)
but...

- Can reach heavy [losses in lines](#)
- Have a limited transmissible power
- Require large wiring cross section to reach acceptable efficiency
- Limited to short distribution distances (
- Efficiency of loads sometimes poorer than AC loads (I.E. CFL
- Battery life time can be drastically reduced by reducing system abuse



DC or AC SHS:

Not a trivial decision, which have to take in account the power level to be distributed and the area (distances) to be covered.

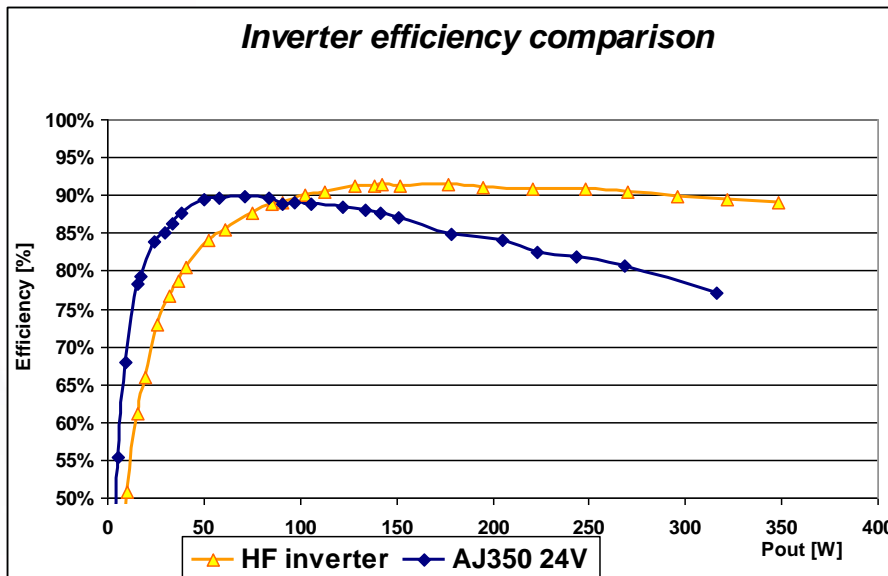


Inverter efficiency in AC SHS

The efficiency of a system is the sum of efficiency of systems parts.
The inverter efficiency is one key part of it.



Inverter topology/power	Efficiency @ 300W
HF 350 W nom.	90%
BF 300 W nom.	78%



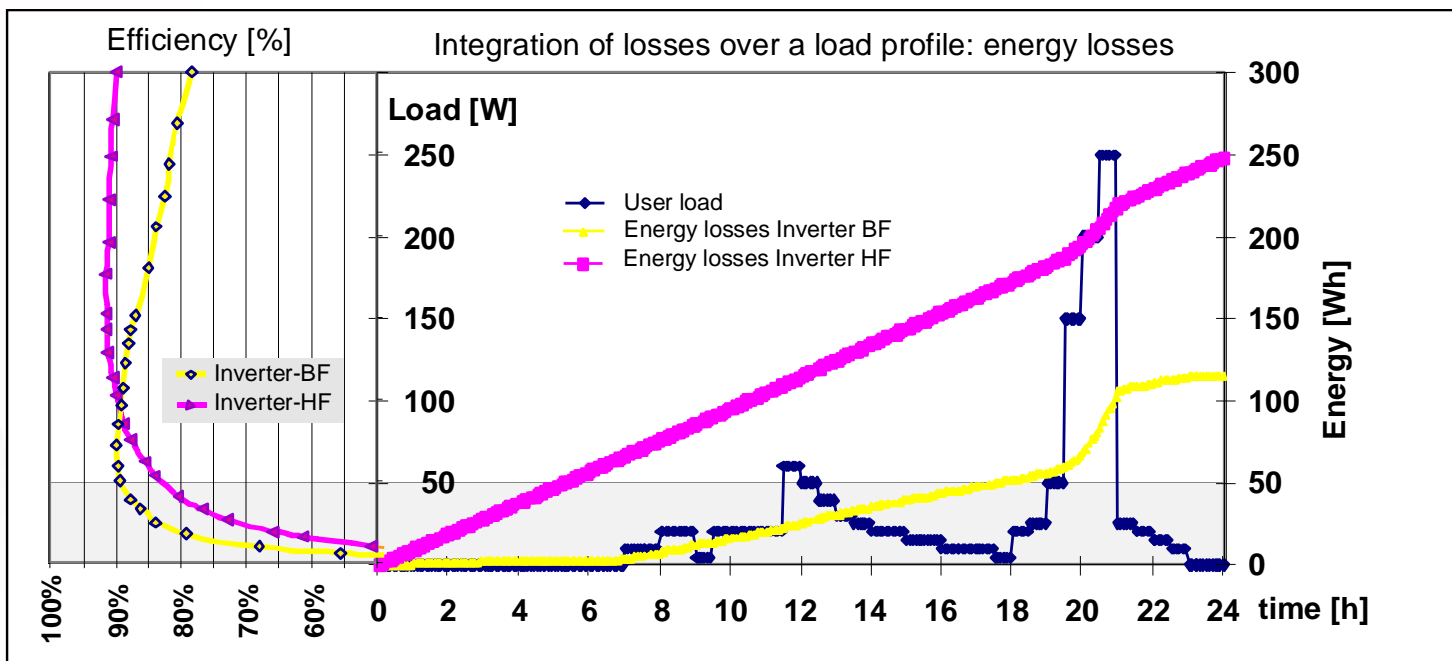
Be careful when interpreting very sexy curves from manufacturer: this could hide some other key parameters like **no-load consumption** and **stand-by consumption**.

Efficiency in AC SHS

The **efficiency at partial load** is a key point to obtain an acceptable system efficiency. The **no load consumption** is a good indicator of this key point

An efficient and **sensible standby** system is a must to insure a reasonable system efficiency in “small” AC SHS

Integration of losses for a 610 Wh/day simulated load profile



Efficiency /reliability in AC SHS

The efficiency and reliability of AC SHS depend on efficiency and reliability of inverter but also on efficiency and reliability of all other parts on the system.

Lighting efficacy: AC CFL are usually better in efficacy (10 to 30%) comparing to DC CFL (but difficult to have third part data for DC CFL)

Thanks to a well developed third part survey bodies, high quality AC products are well highlighted and a real large choice of good quality products is offered by the market.

Most of appliances are more cost effective and often with a better price/quality ratio in AC than DC appliances thanks to the mass production, high competition and well developed quality standards.

Battery are often abused by AC loads

The presence of AC may push users to experiment heavy load like rice cooker or refrigerator ect. Choosing **inverter with limited power** will reduce the risk: a 300W inverter will not accept a rice cooker or iron
This risk is as well true in DC. (keeping the light or TV on all the day long will also abuse the battery).

Whatever DC or AC solution is used, the user must and will learn how to cope with the limited resource of solar.

The point is:

The battery must not be not be destroyed during these learning session.

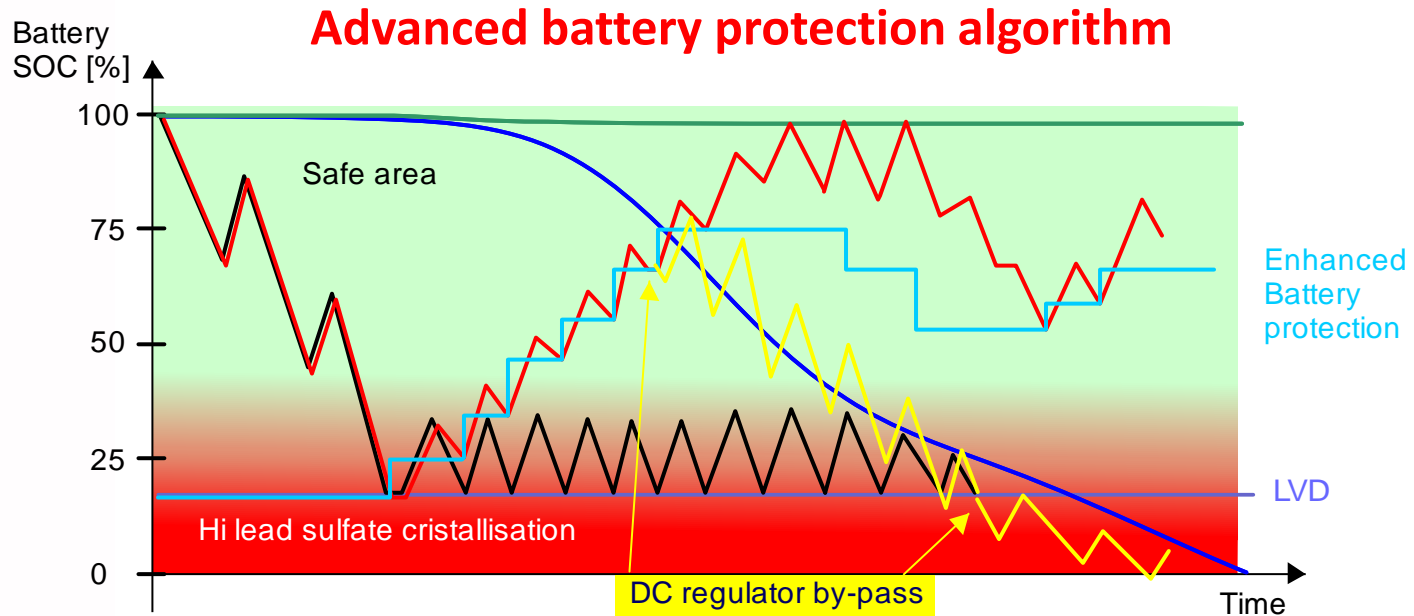
The AC system has a very important and neglected intrinsic features:

In an In an AC SHS, all the **loads are AC and can't be connected directly to the battery**

There is no way to bypass the LVD (low voltage disconnection) in an AC SHS.

There is no way to bypass AC SHS

The standard LVD strategy can play his role



AC systems allow advanced battery protection algorithm to be fully efficient

No LVD bypass mean a “learning session” non destructive for the battery, improving considerably the battery life.

Some other good reason to choose AC for small/medium solar home

- Easy installation using standard installation material
- Larger choice of high efficient appliances (qualified by third parts bodies)
- Lighting efficacy usually better due to higher AC CFL efficacy
- A full reliable control on battery management
- Sustainable investment ready for the future coming grid
- Installation compatible with a back-up generator
- Reduced risk of fire
- Compatible with much longer wiring
- Cost effective over lifetime of the system

**Thank you for your attention,
And enjoy all benefits of small AC SHS ...
with suited AC inverter tailored for
particular requirement of rural
electrification.
And let's discuss about!**

