Differential Power. Less Energy Processing

Reduce volume, weight and losses of power converters, designing them in the Fundamental Limit of Power Conversion to minimize their internal power processing

Power converters with the same nominal power may process very different "internal" or "indirect" power, which is the metric that determines their volume, weight and losses. The fundamental lower limit of this "indirect power" may be calculated, and defined as "Differential Power".

"3-port Power converters" required in energy buffered architectures for PV panels, batteries and renewable energy can be designed with a 2x reduction in losses, weight and volume.

Technology solution supported by the Technical University of Madrid

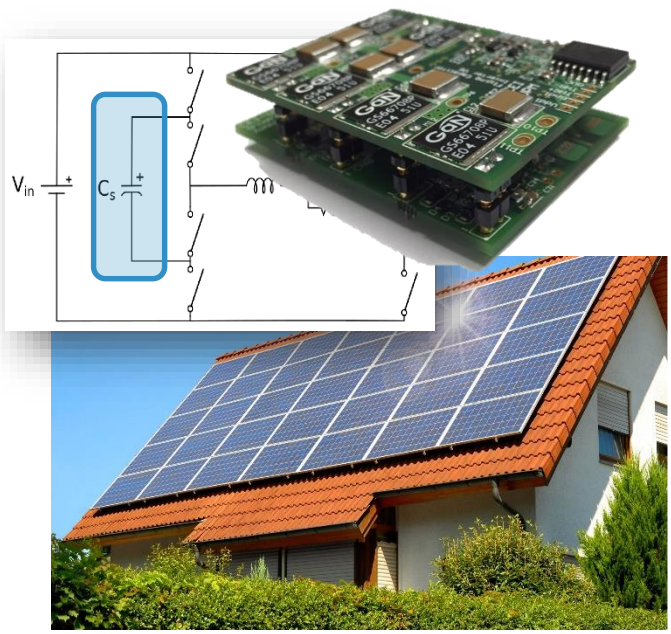
Technology solution

A single-stage power converter replaces the typical 2 stage architectures, either cascaded of with Parallel Active Filter.

The power converter is synthesized besed on the Fundamental Limit of indirect power. The proposed topology is a 3-level inverter, but the flying capacitor is used also as line frequency storage capacitor. **This is the key innovation.**

The "indirect" power processed by the power components is half of the power processed by state of the art architectures, which yields a 2x factor reduction in losses, weight and volumen.

- *Single-Stage topology*
- $P_{ind} = \frac{1}{2} P_{ind_{SoA}}$
  $(0.2P) \quad (0.4P)$
- $3 - level\ "flying - storage\ capacitor"$

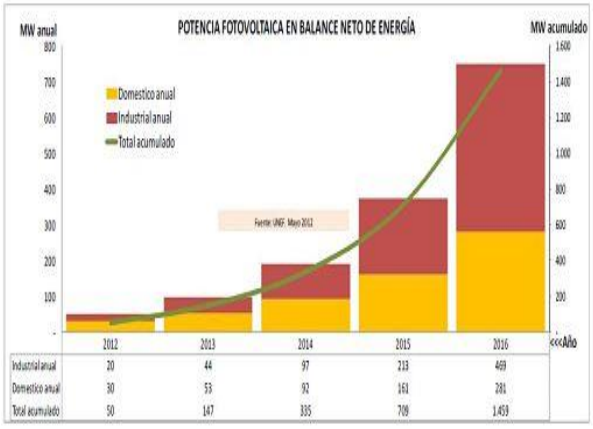


Areas of application

- **Energy**: PV panels and batteries for domestic self-consumption
- **ICT, power conversion**: minimal internal energy processing in power converters.

Market demands

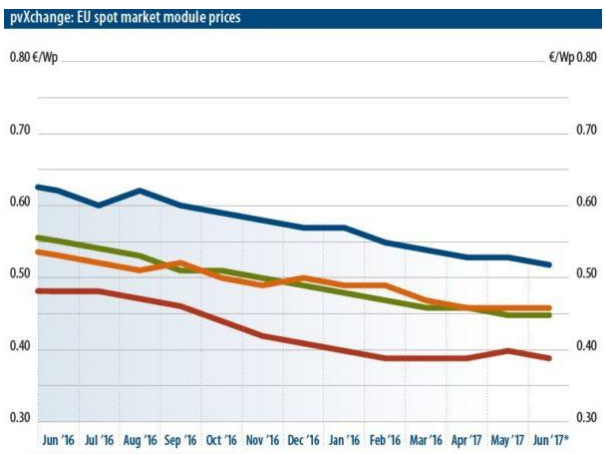
- **PV for Industrial and domestic self consumption**
  - Installed power is growing consistently in the last years, as a cponsequence of hte price reduction of the PV panels, which are cost effective without any subsidize.
  - Every PV installation uses one inverter as the ones proposed here, which reduce energy loss by a factor of 2x.



Price of PV is competitive now and installed power is growing consistently. Our technology replaces current bulky inverters for efficient, light weight power converters.

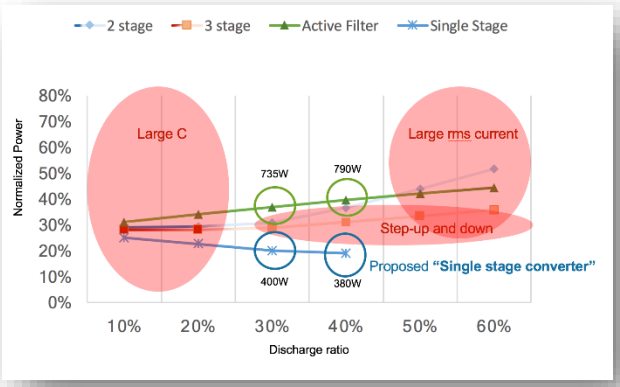
Market potential

- **Price of PV panels**
  - Price of PV panels is consistently being reduced along the last years, being competitive now compared with the other energy alternatives.



Competitive advantages

- There is an expected factor of 2x in the reduction of losses, weight and volume of inverters for PV panels and batteries for domestic self-consumption.
- This factor is based on the fact that the power components of the proposed inverter processes half of the power than commercial products.



References

- Google "Little Box Challenge competition" https://littleboxchallenge.com

Development stage

- ◯ Concept
- ◯ R & D
- ⊕ Lab Prototype
- ◯ Industrial Prototype
- ◯ Production

Contact Differential Power

José A. Cobos
e: ja.cobos@upm.es
w: http://www.cei.upm.es/people/faculty/jose-antonio-cobos/

UPM contact
Innovation, Commercialization and Entrepreneurship Area
Centre of Support for Technological Innovation – UPM
e: innovacion.tecnologica@upm.es