



Education Uninterrupted: Creating Campus Microgrids for Schools and Universities

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THE FUTURE OF POWER CONVERSION HAS ARRIVED

Ideal Power At A Glance

- In business since 2006; Publicly traded (NASDAQ) since November 2013
- Headquarters and R & D Lab located in Austin, Texas
- Manufacturing in the USA
- Over 80 United States and Foreign Patents combined on core technologies
- Employs over 25 people in California & Texas



Ideal Power trades on NASDAQ under ticker symbol IPWR

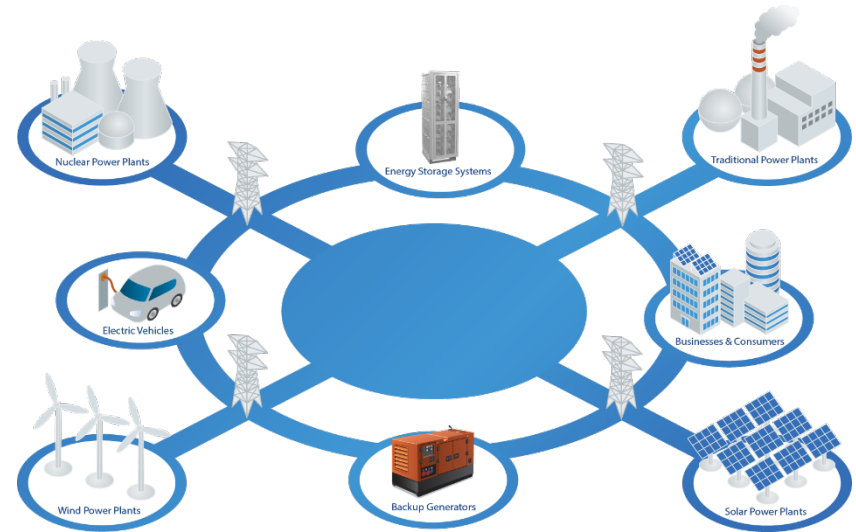
PPSA™

Power Packet Switching Architecture

- Bi-directional
- Multiport
- Efficient
- Compact
- Cost Effective

PPSA links solar, batteries and EV's to the Grid

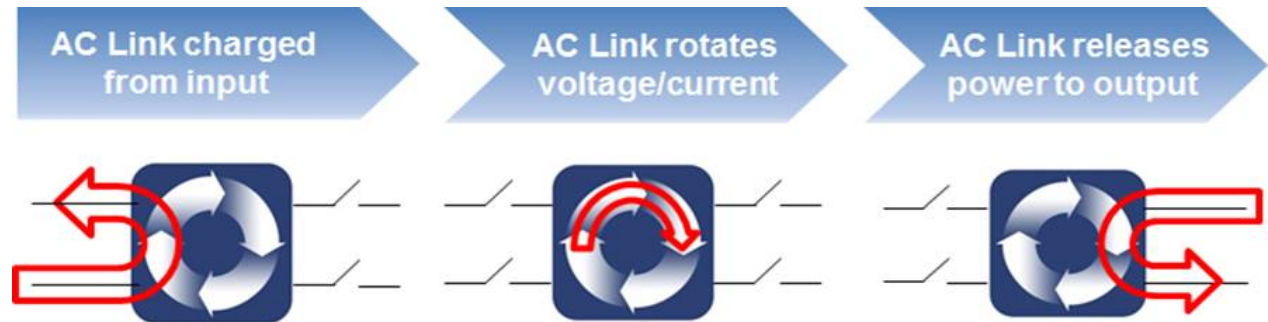
- Grid-following, supports both 60 Hz & 50 Hz
- Grid-forming: maintains power to critical loads, during grid outages and brownouts



The PPSA Difference

Ideal Power PCS

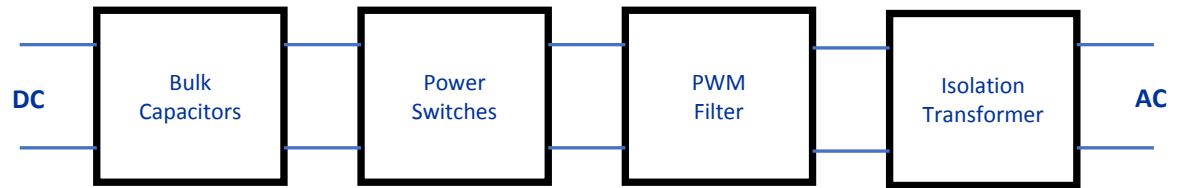
- 100% indirect power flow; all power temporarily stored in high-frequency AC Link Transformer
- Eliminates ~90% of passive components
- Compact & Efficient



VS

Conventional PCS

- Power flows continuously from input to output
- Dependent on bulky passive components increasing costs
- Lower efficiency



Compact and Efficient

PPSA eliminates passive components that have been the mainstay of power conversion for decades: replacing Line Reactors, DC Chokes, and Electrolytic Caps with IGBT Modules and smart Firmware.



The MUSH Market

- Municipalities
- Universities & Schools
- Hospitals

Vast majority of the deployed solar + storage systems are not capable of supporting critical loads in the event of a grid outage.

Whether it is to ensure that vital life support systems remain online at hospitals, that important government services continue uninterrupted, or to allow students to finish their school day, today's backup power solution of choice is usually a diesel generator.

The problem is that they are dirty, expensive to operate, and are generally an unreliable power source.



Case Study

Critical load support and
lower utility bills for California schools



Case Study: The Power Problem

- In California, **high energy costs** are the second largest operating expense for many school districts.
- 2 major energy cost components:
 - 2nd highest kWh rates in the nation
 - Demand Charges can be 30+% of a school's monthly bill.
- Grid outages increasingly frequent: transmission and generation infrastructure stressed by limited budgets, weather extremes, suburban growth and "NIMBY"
- Sending students home is increasingly complicated and disruptive



Case Study: The Resilient Solution

Solar + Storage offsets energy use, reduces peak demand, and provides backup power

- Six schools campuses located in Santa Rita Union School District
- Over 1 MW of PV
- 1.2 MWh of Sharp SmartStorage[®]
- 35x Ideal 30 kW Stabiliti[™] Converters – the only manufacturer qualified for the SmartStorage system

Estimated completion date: 12/31/17



Rendering of Solar plus Sharp SmartStorage[®] system at Bolsa Knolls Middle School.

Image courtesy of SolEd Benefit Corp.



Case Study: Project Impact

- During some months, as much as **70-80%** of Santa Rita Union School District's electricity needs will be met by the Solar + Storage System.

"This is a precedent-setting project, because, in addition to providing substantial utility bill savings, the SmartStorage® system will also provide backup power for critical school loads in the event of a grid outage.

In the past, commercial buildings have relied on expensive diesel engine generators to provide backup power. This project will demonstrate that renewable power generation coupled with a SmartStorage® system is now a viable, bankable, cleaner alternative for backup power applications."

Carl Mansfield, General Manager of Sharp's
U.S.-based Energy Systems and Services
Group.



Case Study: Site-Specific Challenges

- Integrated solar + storage solutions still unfamiliar to most utilities
- Difficult to decode complex solar tax credits and incentives
- Site-specific PV designs required for each campus to locate PV Arrays, power converters, switchgear, support equipment and batteries
- Access and installation window
- *Critical loads not well understood*
- *Genset integration often challenging*
- *Complex system testing and commissioning*

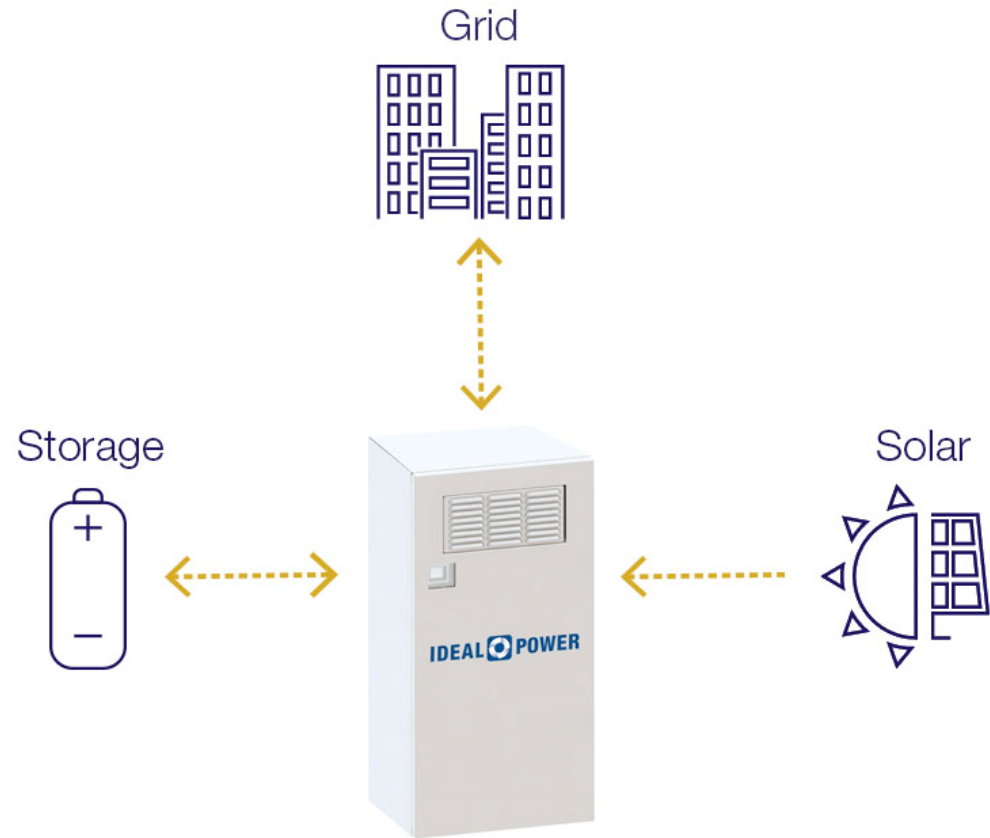


Project site at Bolsa Knolls Middle School in Salinas, California.



The Ideal Solution

- Advanced multiport power converters now offer grid-forming capabilities, enabling the creation of an in-building microgrid powered by the sun with batteries providing additional energy when the solar resource alone cannot support building critical loads.
- Minimize/eliminate the need for backup generators at an attractive cost point for both new solar + storage installations as well as retrofits.
- High quality resilient power to the facility and the transition from grid power to backup power is rapid and not disruptive to business operations.



30kW Multiport PCS • Model Number 30C3

Bad Weather Blues

- In 2012, the United States suffered damages that totaled over \$11 billion dollars due to weather disasters – the second most for any year on record (behind 2011).
- The U.S. energy sector in general, and the grid in particular, are vulnerable to the increasingly severe weather expected as our climate changes (source: DOE 2013).
- Microgrid ready solar + storage systems are already capable of handling many critical load-based applications and will very soon become an integral part of any MUSH facility's business plan, particularly in areas such as the Northeast, the Gulf Coast, and the West Coast where severe weather and/or natural disasters occur with more frequency.



Thank You

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Microgrid Demos on our
YouTube Channel

