



ESCUELA DE INGENIERÍA
FACULTAD DE INGENIERÍA

reclab
POWER & ENERGY CONVERSION LABORATORY

HYBRID CONVERTER

Multiport power converter



DEPARTAMENT OF ELECTRICAL
ENGINEERING



INDUSTRIAL SECTOR
ENERGY



DEVELOPMENT LEVEL
TRL 5

PROBLEM



The transition to sustainable energy systems faces significant structural challenges. Renewable sources such as solar and wind are variable and intermittent, making them difficult to integrate into traditional power grids. These challenges are compounded by the limited capacity of existing infrastructure and the need to add storage. Current solutions require multiple energy conversions, increasing costs, reducing efficiency, and limiting widespread adoption of clean technologies.

SOLUTION



The technology is a multiport power converter that integrates photovoltaic generation, energy storage, and electricity consumption into a single system. It acts as an intelligent manager that coordinates energy flows in real time, optimizing the use of available energy according to demand and generation conditions. It thereby transforms a fragmented system into an integrated, efficient, and flexible one that can adapt dynamically to different operating scenarios.

MARKET



The solution targets energy companies, renewable-project developers, the green-hydrogen industry, electrical-equipment manufacturers, and companies with high energy demand. Applications include solar systems, microgrids, off-grid operation, and energy management in buildings and industrial facilities. This market has strong global growth potential, driven by the energy transition, electrification of demand, and the need for efficient solutions.



Professor(s)
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Intellectual property
Patented in Chile (2024)
and the United States (2025).

Development status
Progressing toward TRL 6
(demonstration in an
operational environment).

ADVANTAGES



High energy efficiency,
with values
approaching 99.4%.



Operational flexibility
with multiple storage
technologies.



Lower costs through fewer
conversion stages and
reduced infrastructure
requirements.



Integrates generation,
storage, and
consumption into a
single system.