



Distributed DC/DC architecture for an LVDC hydrogen production microgrid based on concentrated photovoltaic sources

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Distributed DC/DC architecture for an LVDC hydrogen production microgrid based on concentrated photovoltaic sources

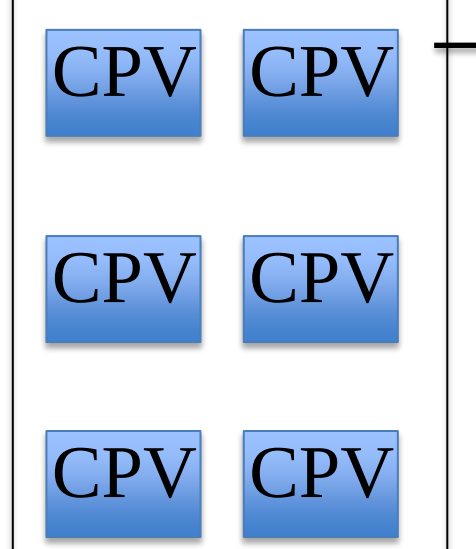
Kolja Neuhaus, Corinne Alonso

In the context of the decrease of fossil fuels and ecological transition, hydrogen production has been identified as a solution for storage consumption of renewable energies. High efficiency solar cells can be used in conjunction with solar concentration to further push the limits of photovoltaic energy production. In order to maximize this production, high precision solar tracking in addition to optimized conversion devices are needed. In this study, a distributed DC/DC architecture is proposed with a Low Voltage DC microgrid, aiming to optimize energy flows between high efficiency concentrated photovoltaic production and hydrogen production from electrolyzers.

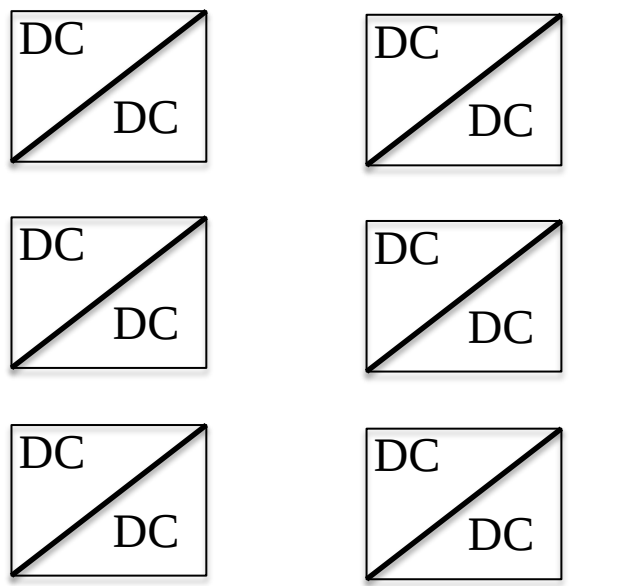
LVDC microgrid for hydrogen production based on concentrated PV

RCAST, Tokyo

Concentrated Photovoltaics



Conversion stage

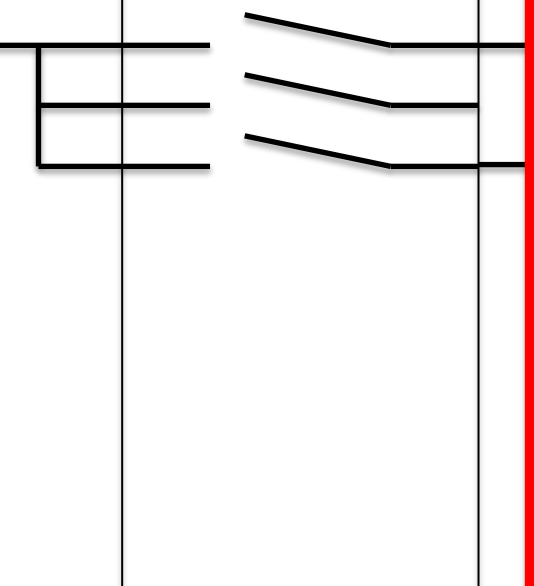


Distributed architecture

MPPT

CPV part

SWITCH matrix



SWITCH CONTROL

RCAST, Tokyo

TANKS

H⁺

EC1

EC2

H₂O

DC/DC

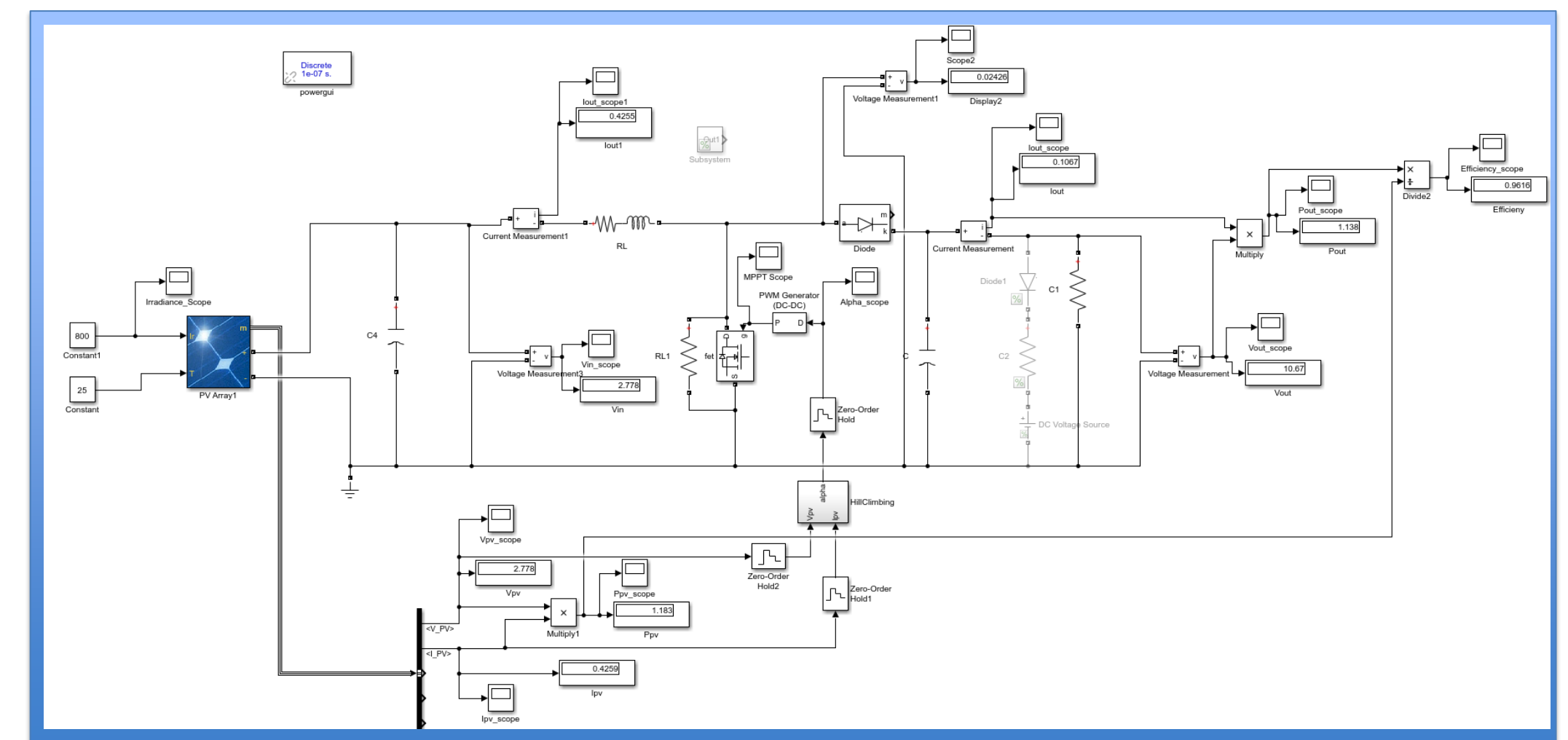
Lithium Ni-MH Supercap

Storage

EC + battery part

LAAS-CNRS, Toulouse

Modelizing CPV, converters and batteries



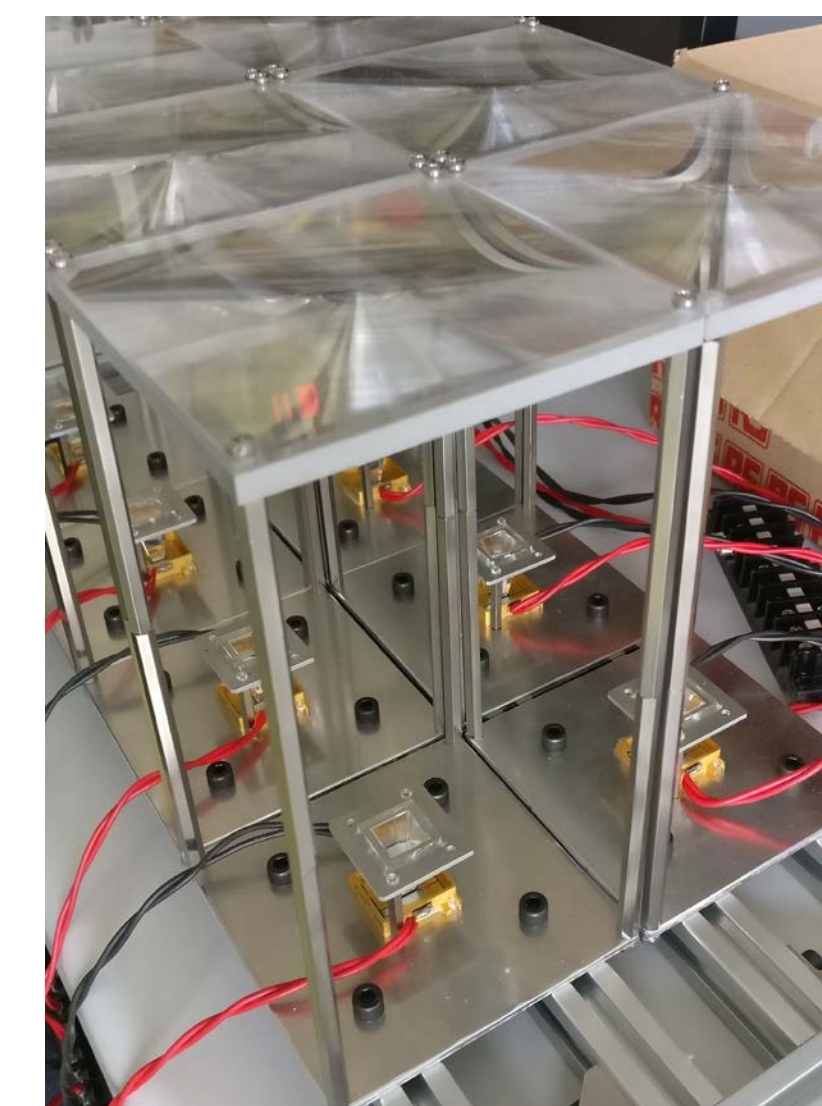
The ADREAM platform LAAS-CNRS, Toulouse, France



AC microgrid for energy production and consumption.
DC microgrid + storage : Lead-acid batteries + supercapacities

Concentrated PV + Tracking

High efficiency cells + fresnel lenses and concentrators



RCAST, Tokyo

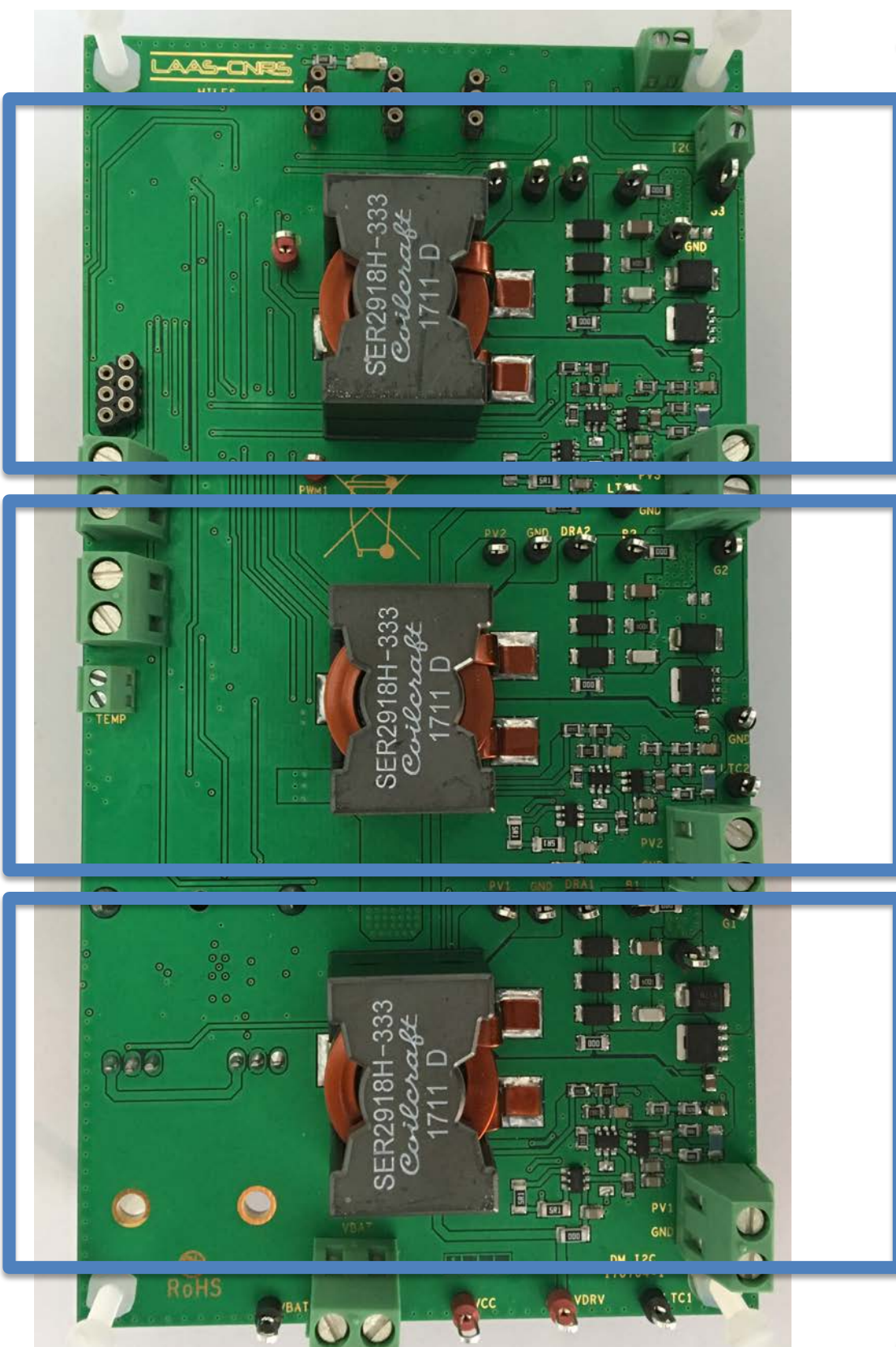
2 axis Solar Tracker

TdAPS
(Time derived Astronomical Positioning System)



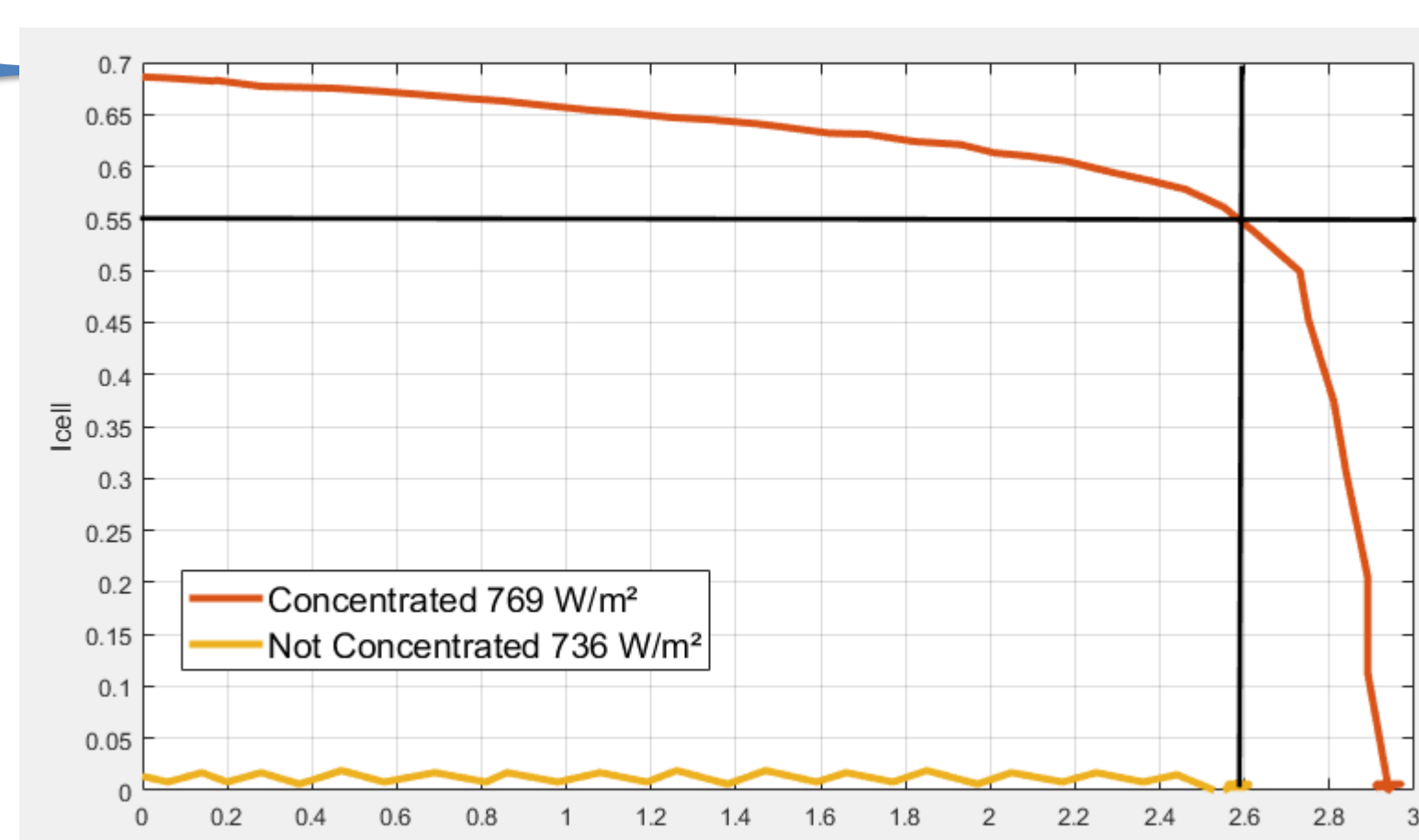
LAAS, Toulouse

Distributed converter architecture



One Single DC/DC Boost converter for each CPV cell + separate MPPT for each.

Exploiting different functioning points, optimizing energy flow



Perspectives



Experimental test with small size electrolyzer cells + CPV

Modelizing Electrolyzer cells in collaboration with RCAST, Tokyo (Equivalent circuit models, EIS)

Extrapolating results for bigger scale hydrogen production.