EMR'22
HES-SO Sion
June 2022

EMR'22 Summer School
"Energetic Macroscopic Representation"

«Power flow distribution in Isolated Microgrids using EMR»

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eifer
European Institute
for Energy Research
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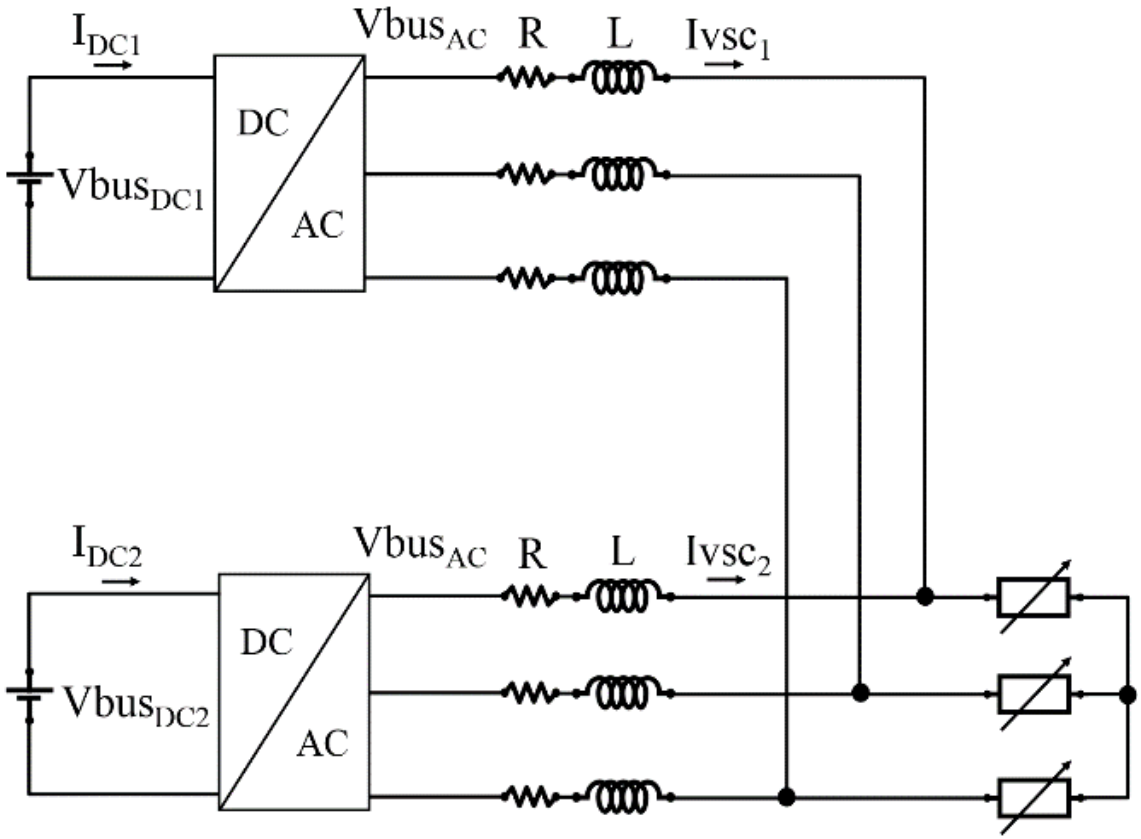
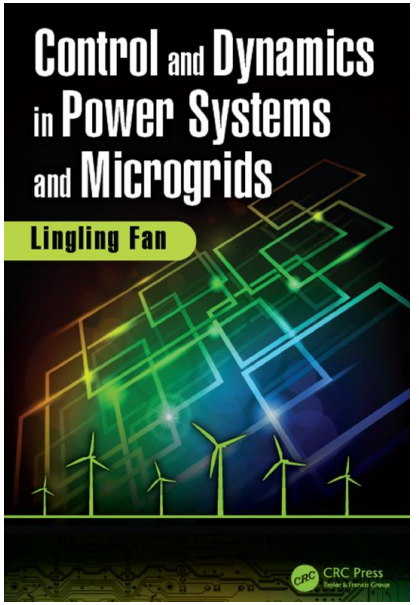
- Outline -

1. **Power Distribution between Two VSC in Droop-PQ Control Mode**

2. **Power Distribution among a Synchronous Generator and Two VSC**

«PART 1. Power Distribution between Two VSC in Droop-PQ Control Mode»

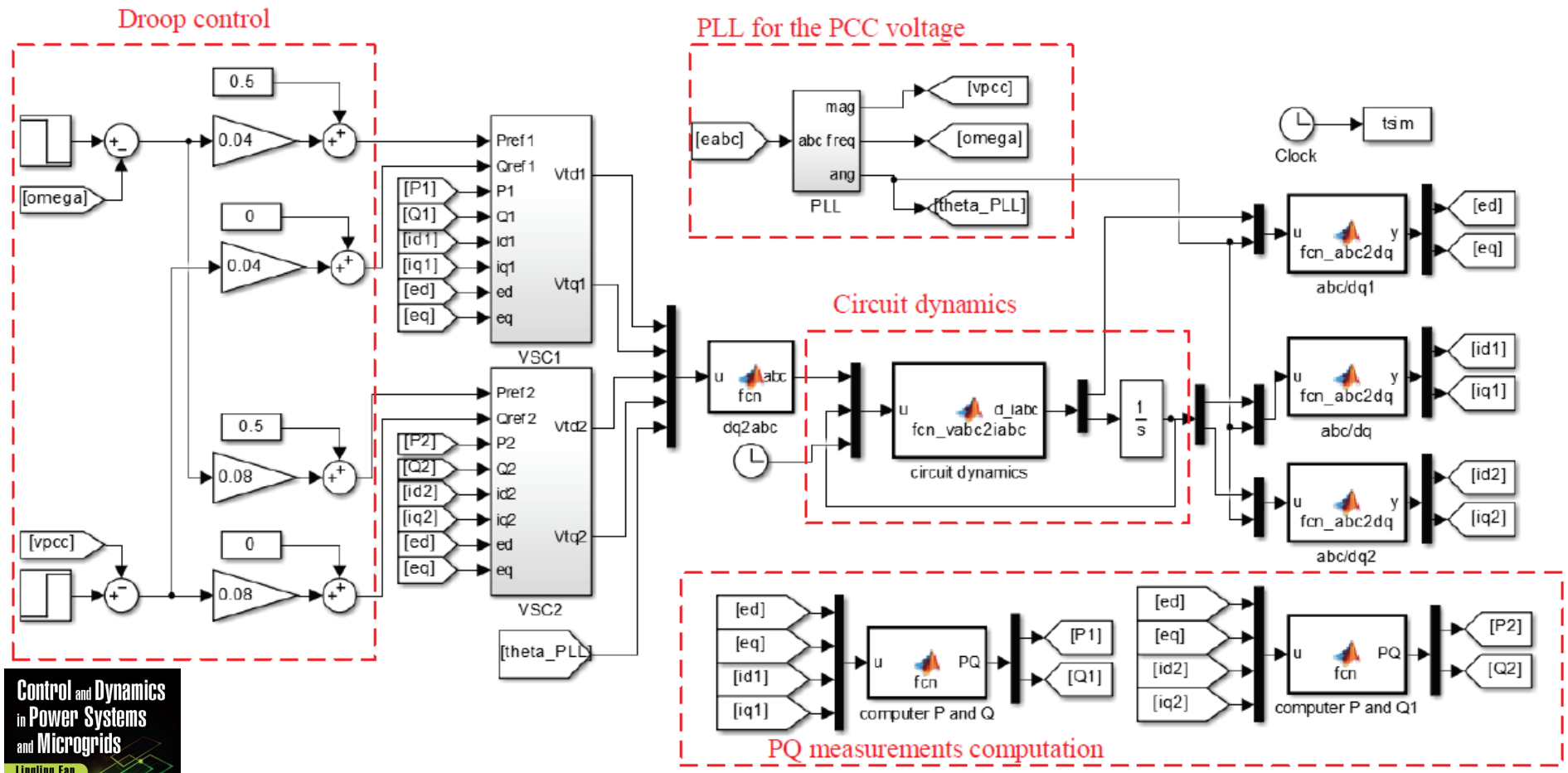


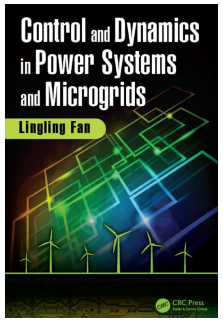


Power Distribution between Two VSC in Droop-PQ Control Mode

Power flow distribution in Isolated Microgrids using EMR

- Two VSC in Droop-PQ Control Mode Implementation-

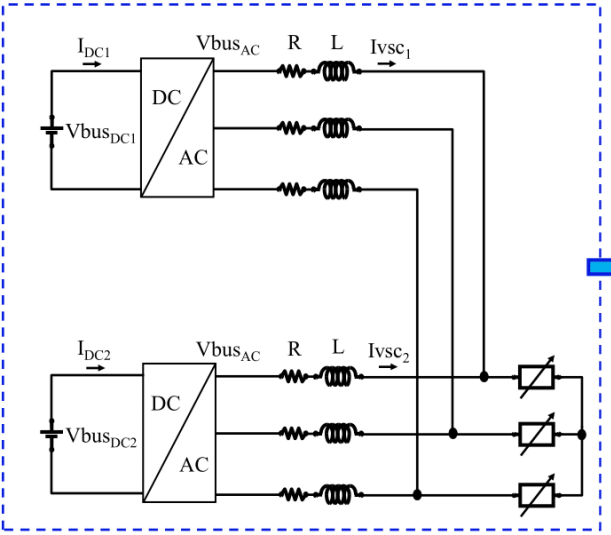




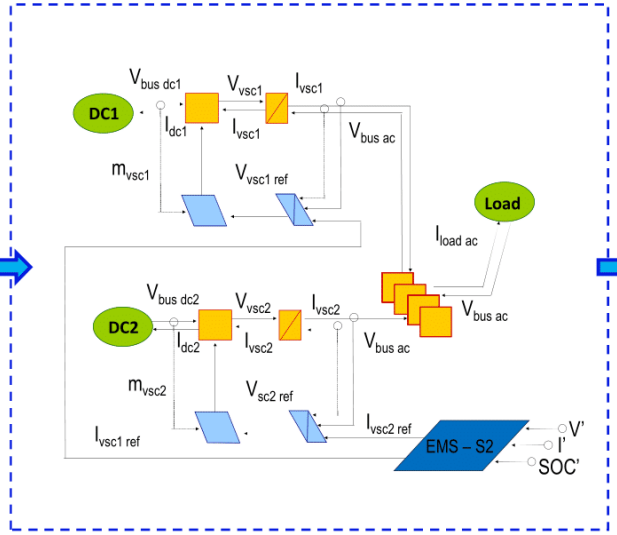
Power flow distribution in Isolated Microgrids using EMR

- Using EMR to organize the model in a different way -

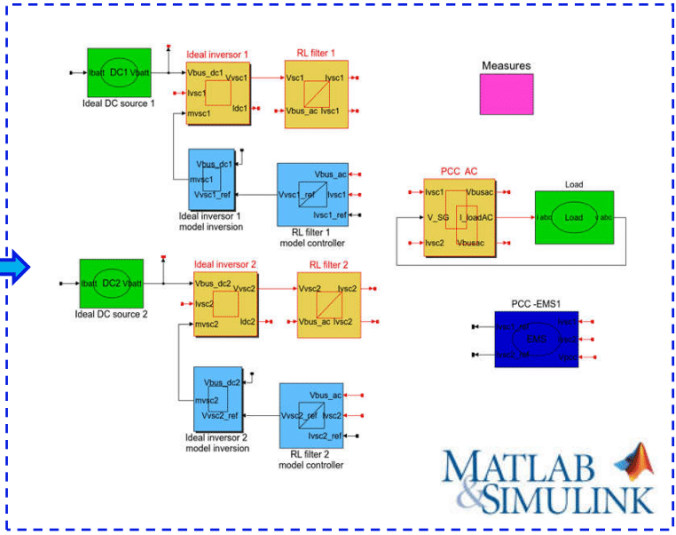
EMR'22, Sion, June 2022



AC-DC Microgrid Scheme



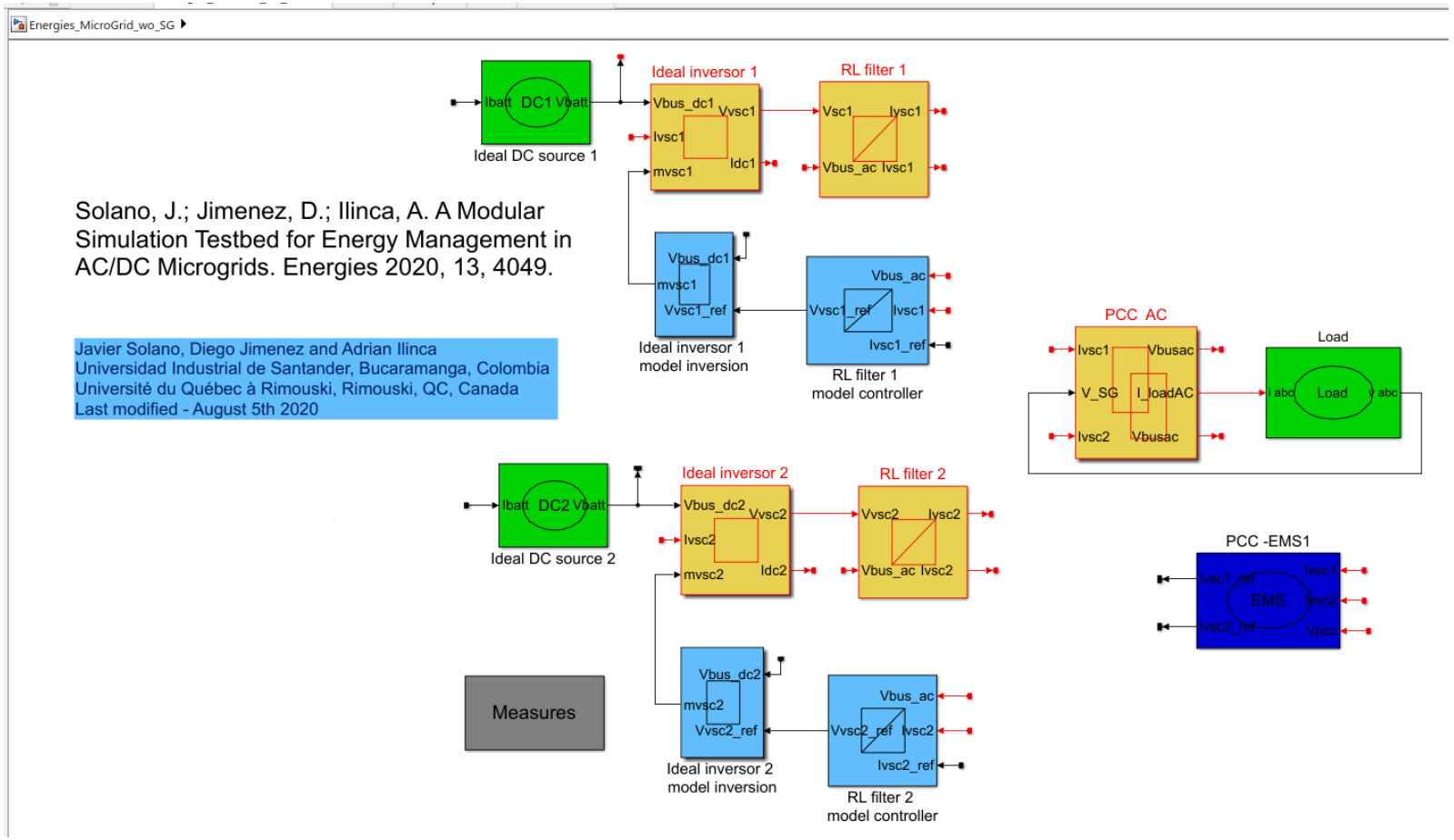
Energetic Macroscopic Representation



Simulation Model

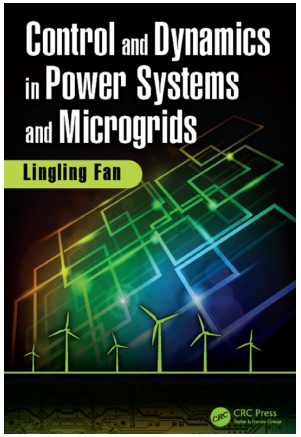
Power flow distribution in Isolated Microgrids using EMR

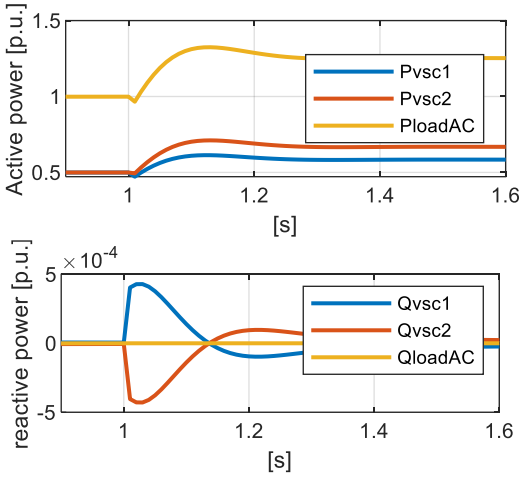
Hybrid source EMR

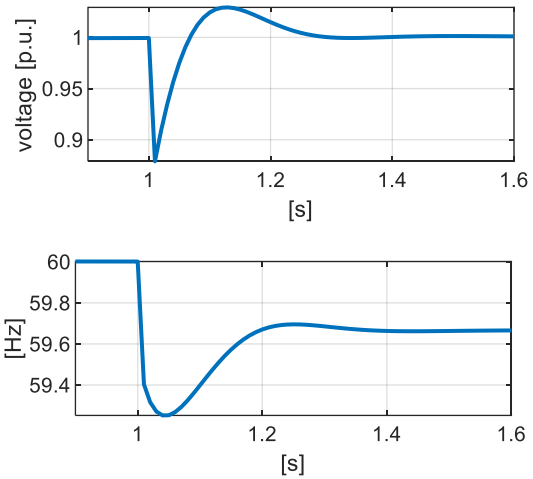


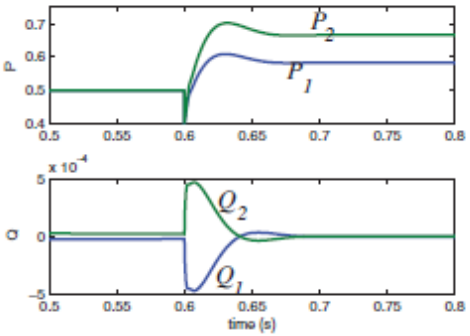
Power flow distribution in Isolated Microgrids using EMR

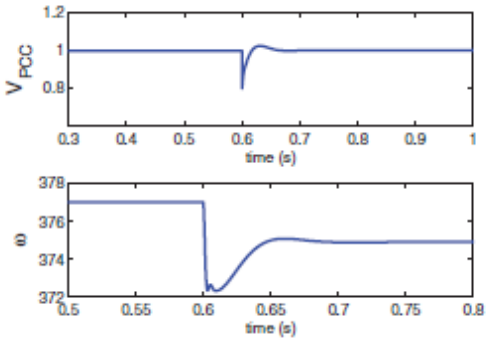
Simulation results

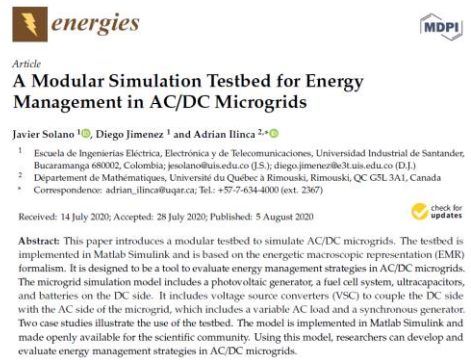












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Article

A Modular Simulation Testbed for Energy Management in AC/DC Microgrids

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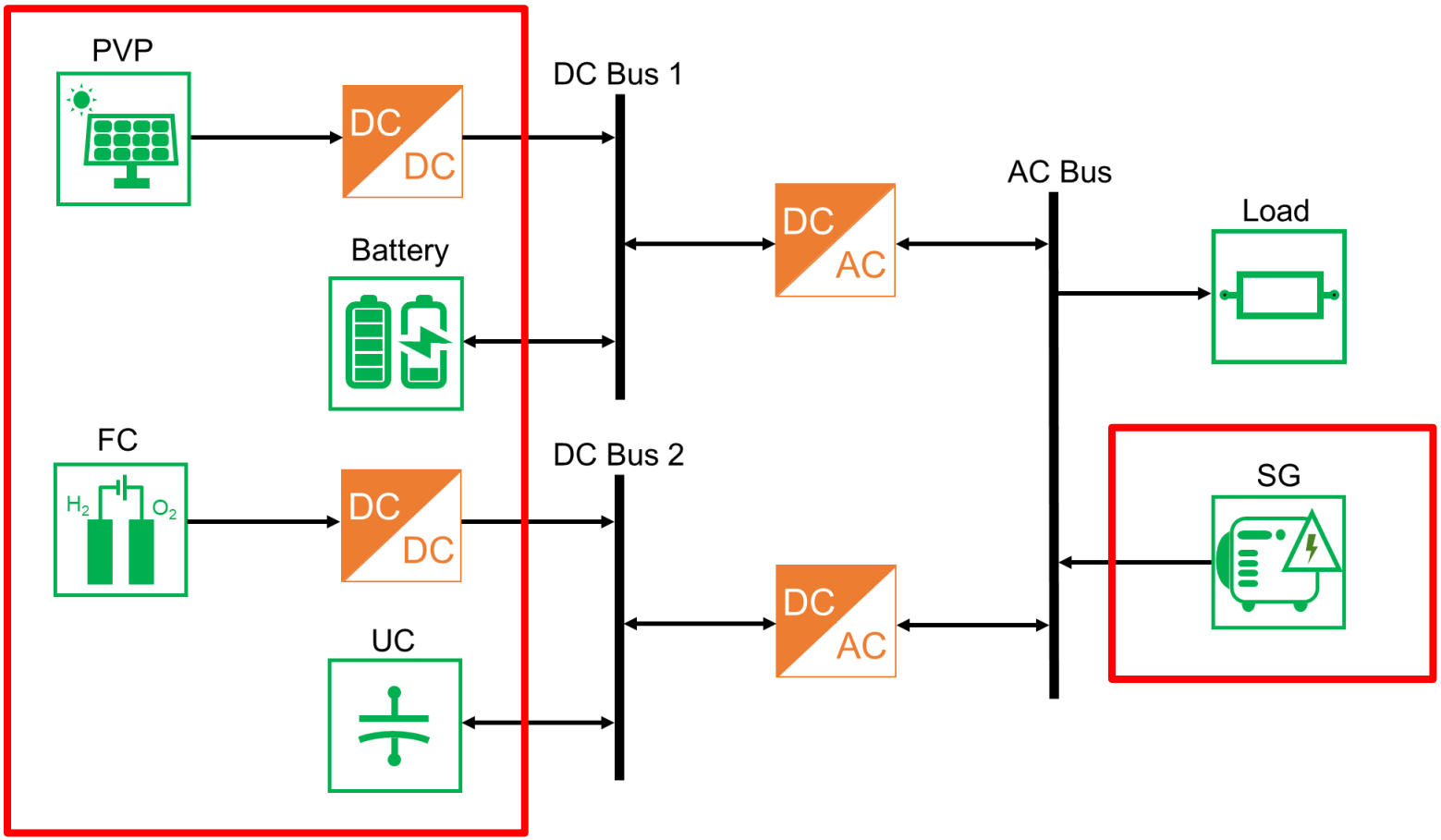
Abstract: This paper introduces a modular testbed to simulate AC/DC microgrids. The testbed is implemented in Matlab Simulink and is based on the energetic macroscopic representation (EMR) formalism. It is designed to be a tool to evaluate energy management strategies in AC/DC microgrids. The microgrid simulation model includes a photovoltaic generator, a fuel cell system, ultracapacitors, and batteries on the DC side. It includes voltage source converters (VSC) to couple the DC side with the AC side of the microgrid, which includes a variable AC load and a synchronous generator. Two case studies illustrate the use of the testbed. The model is implemented in Matlab Simulink and made openly available for the scientific community. Using this model, researchers can develop and evaluate energy management strategies in AC/DC microgrids.

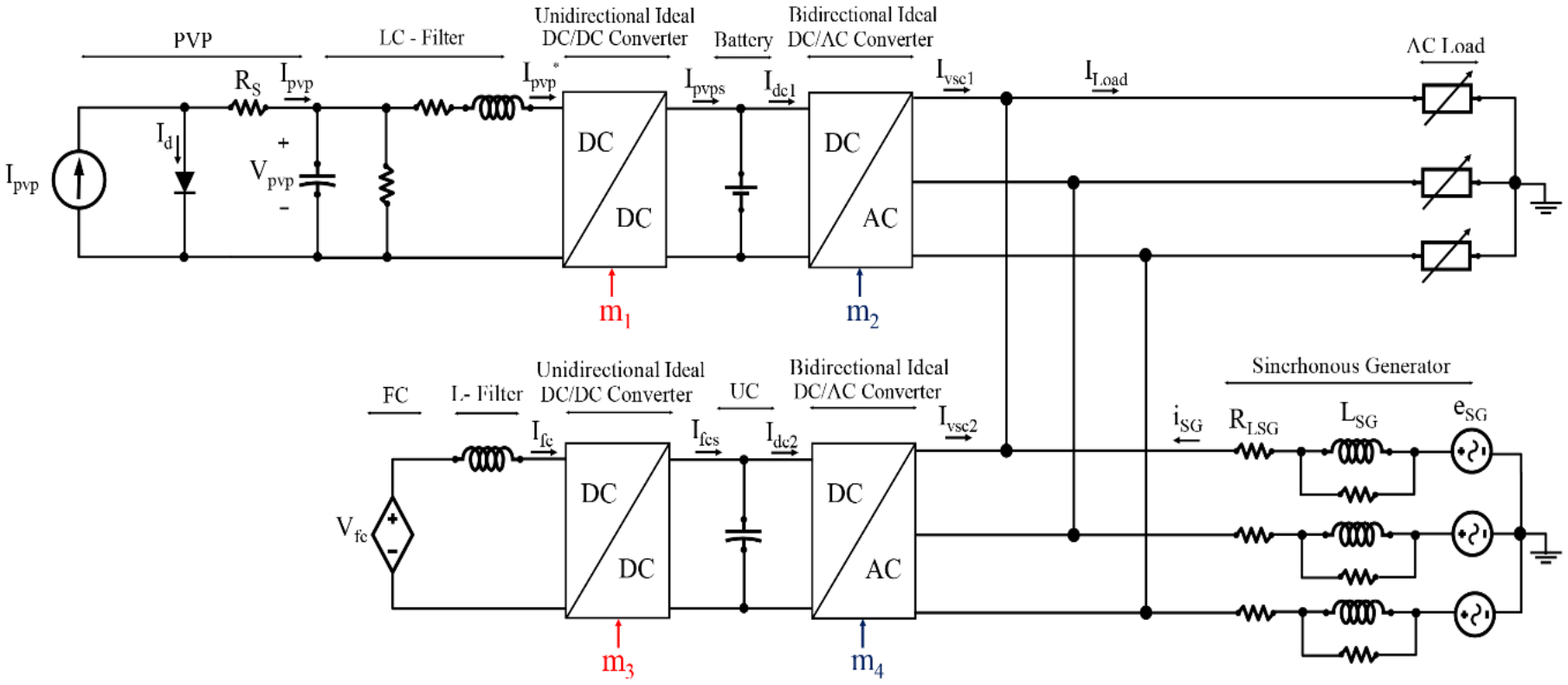
«PART 2. Power Distribution among a Synchronous Generator and Two VSC»

- Hybrid source schematic -



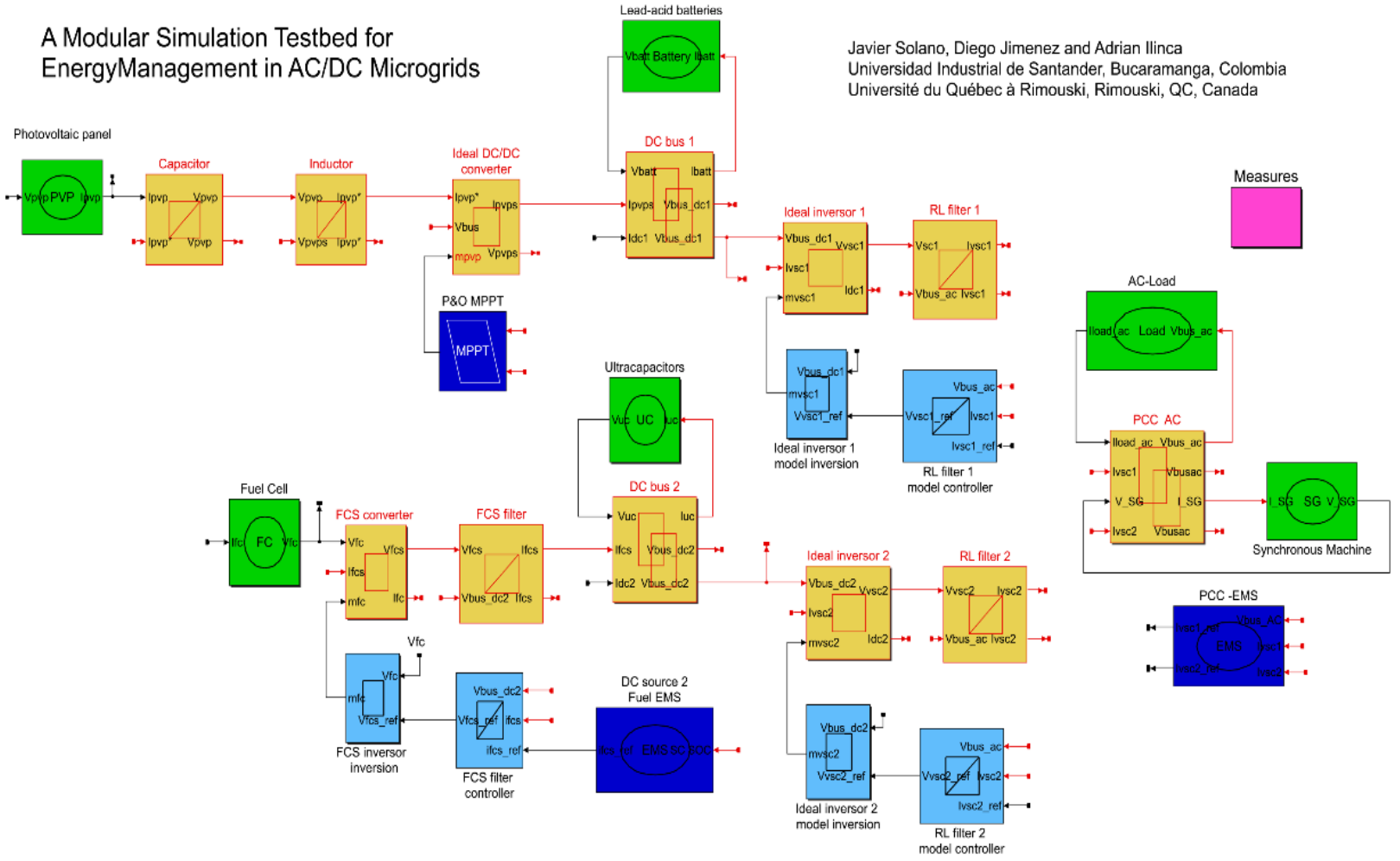
Power flow distribution in Isolated Microgrids using EMR

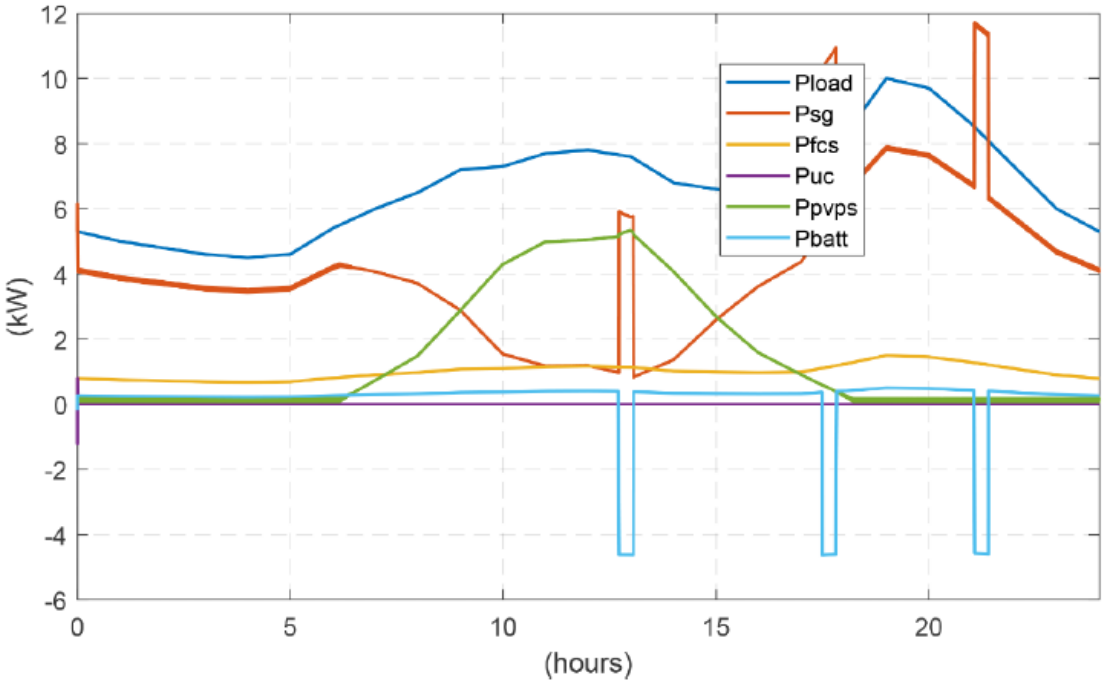
- VSC1 +VSC2 (FC+SC) schematic



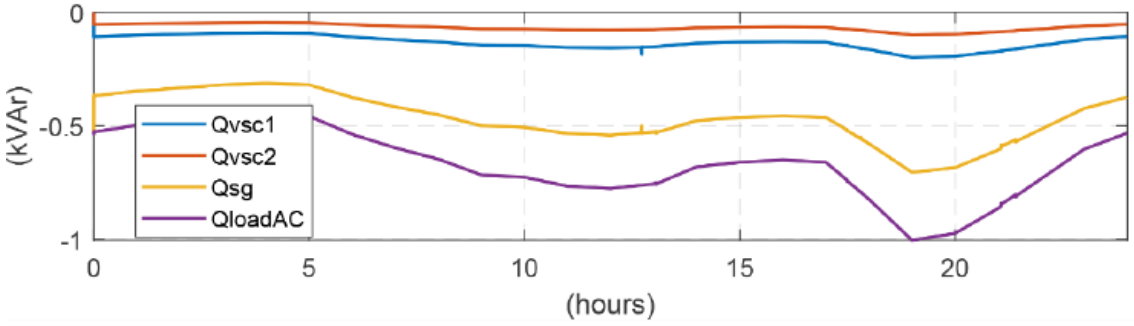
Power flow distribution in Isolated Microgrids using EMR

- VSC1+VSC2 + SM + AC load EMR implemented in Matlab -





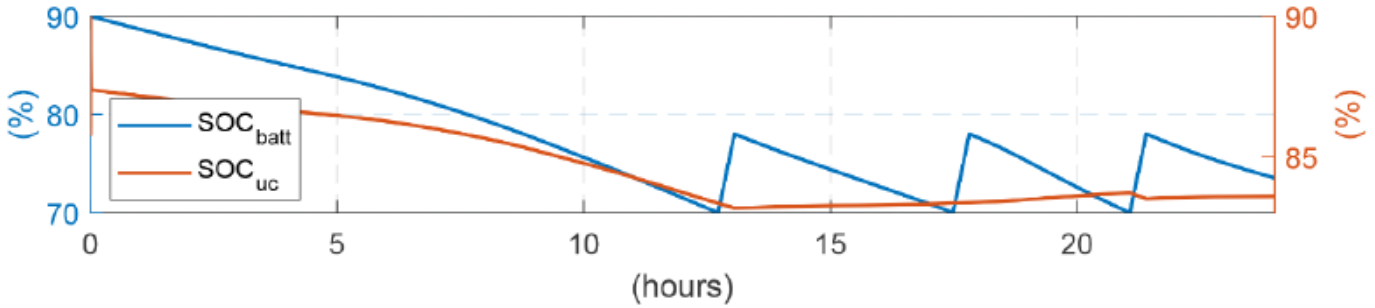
(a) Active AC SG.



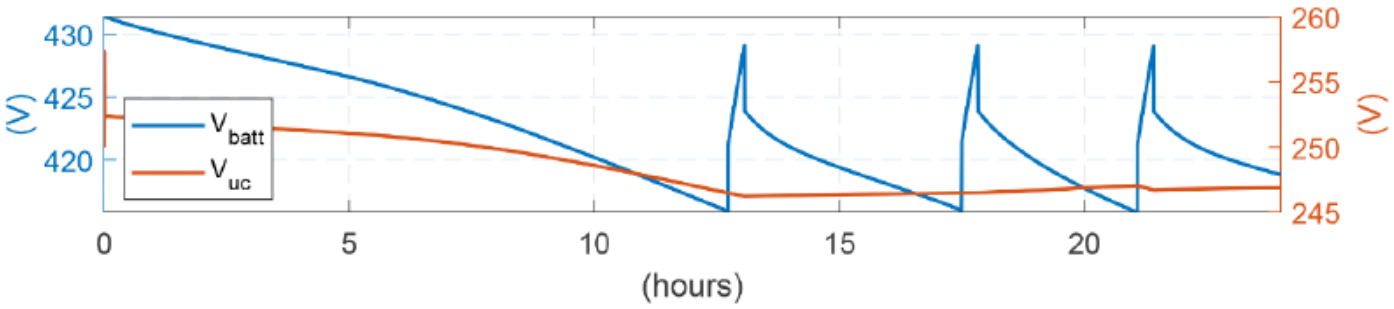
(b) Reactive AC SG.

Power flow distribution in Isolated Microgrids using EMR

- Simulation results -



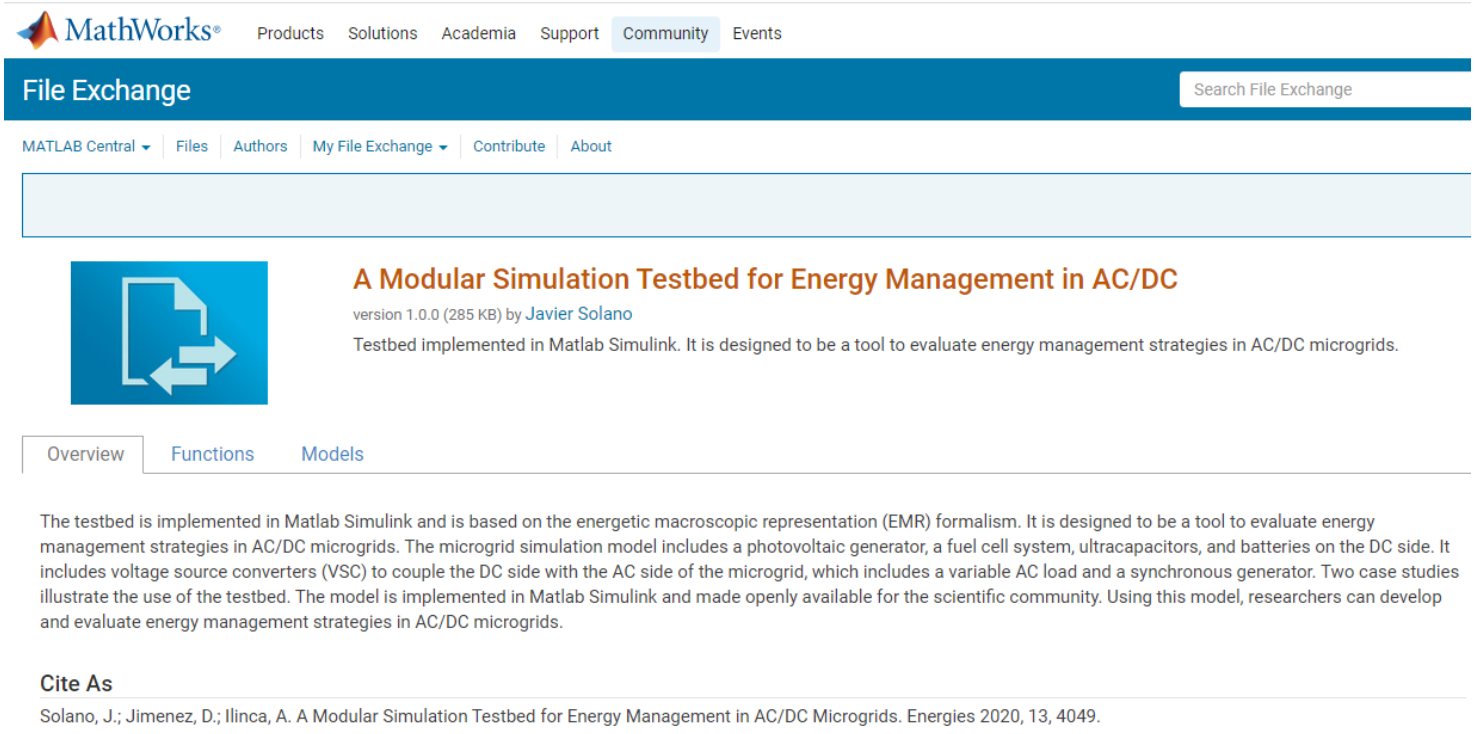
(c) Batteries' and ultracapacitors' SOC.



(d) DC bus voltages.

Power flow distribution in Isolated Microgrids using EMR

- A modular simulation testbed for EM in AC-DC MG-



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A Modular Simulation Testbed for Energy Management in AC/DC

version 1.0.0 (285 KB) by Javier Solano

Testbed implemented in Matlab Simulink. It is designed to be a tool to evaluate energy management strategies in AC/DC microgrids.

Overview Functions Models

The testbed is implemented in Matlab Simulink and is based on the energetic macroscopic representation (EMR) formalism. It is designed to be a tool to evaluate energy management strategies in AC/DC microgrids. The microgrid simulation model includes a photovoltaic generator, a fuel cell system, ultracapacitors, and batteries on the DC side. It includes voltage source converters (VSC) to couple the DC side with the AC side of the microgrid, which includes a variable AC load and a synchronous generator. Two case studies illustrate the use of the testbed. The model is implemented in Matlab Simulink and made openly available for the scientific community. Using this model, researchers can develop and evaluate energy management strategies in AC/DC microgrids.

Cite As

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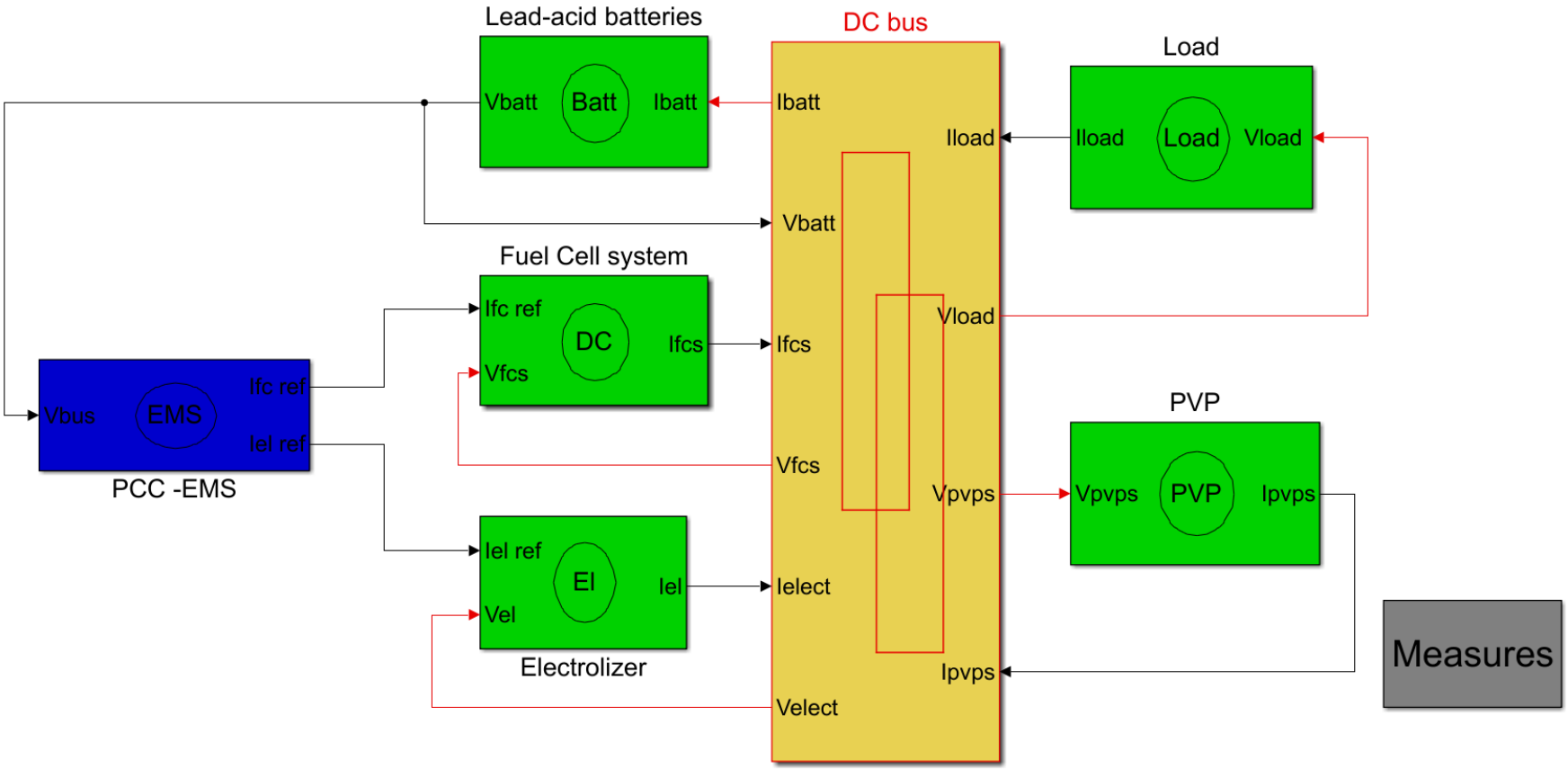
Lead-acid batteries
Vbatt
Batt
Ibatt
DC bus
Ibatt
Iload
Vbatt
Load
Iload
Load
Vload
Fuel Cell system
Ifc ref
DC
Ifcs
Vfcs
Ifcs
Vload
Vbus
EMS
Ifc ref
Iel ref
PCC -EMS
Vfcs
PVP
Vpvps
PVP
Ipvps
Vpvps
Iel ref
El
Iel
Vel
Ielect
Electrolizer
Ipvps
Velect
Measures

« BIOGRAPHIES AND REFERENCES »

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[Fan 2017] Fan, L. Control and Dynamics in Power Systems and Microgrids; CRC Press: Cleveland, OH, USA, 2017.

[Solano 2020] Solano, J.; Jimenez, D.; Ilinca, A. A Modular Simulation Testbed for Energy Management in AC/DC Microgrids. Energies 2020, 13, 4049. doi.org/10.3390/en13164049.