



V CONGRESO
SMART GRIDS
Madrid, 13 Diciembre 2018

GESTIÓN AVANZADA DE MICRORREDES COMO MECANISMO DE FLEXIBILIDAD

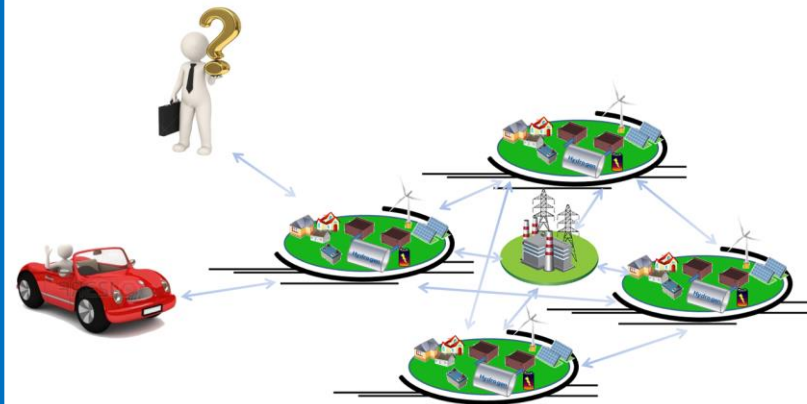
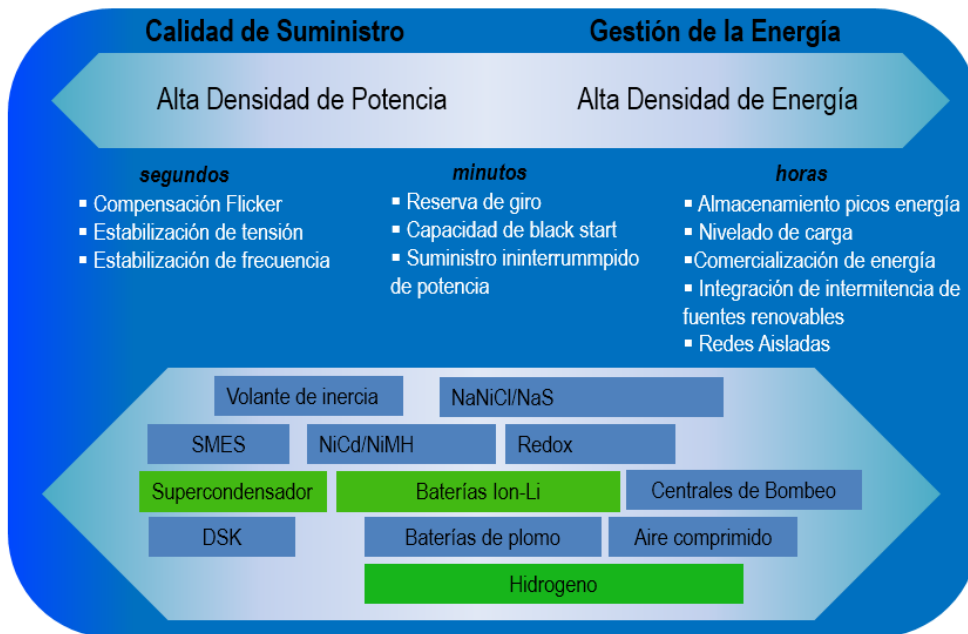
Dr. Félix García-Torres

Responsable Laboratorio de Microrredes

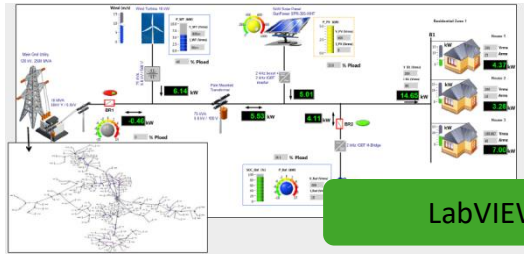
Centro Nacional del Hidrogeno

INTRODUCCIÓN

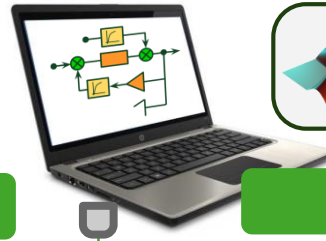
- La introducción de microrredes en los sistemas eléctricos de potencia puede convertirse en un elemento clave para satisfacer la flexibilidad requerida para los retos de un sistema energético basado en energías renovables y vehículos eléctricos.



LABORATORIO DE MICRORREDES CNH2



LabVIEW

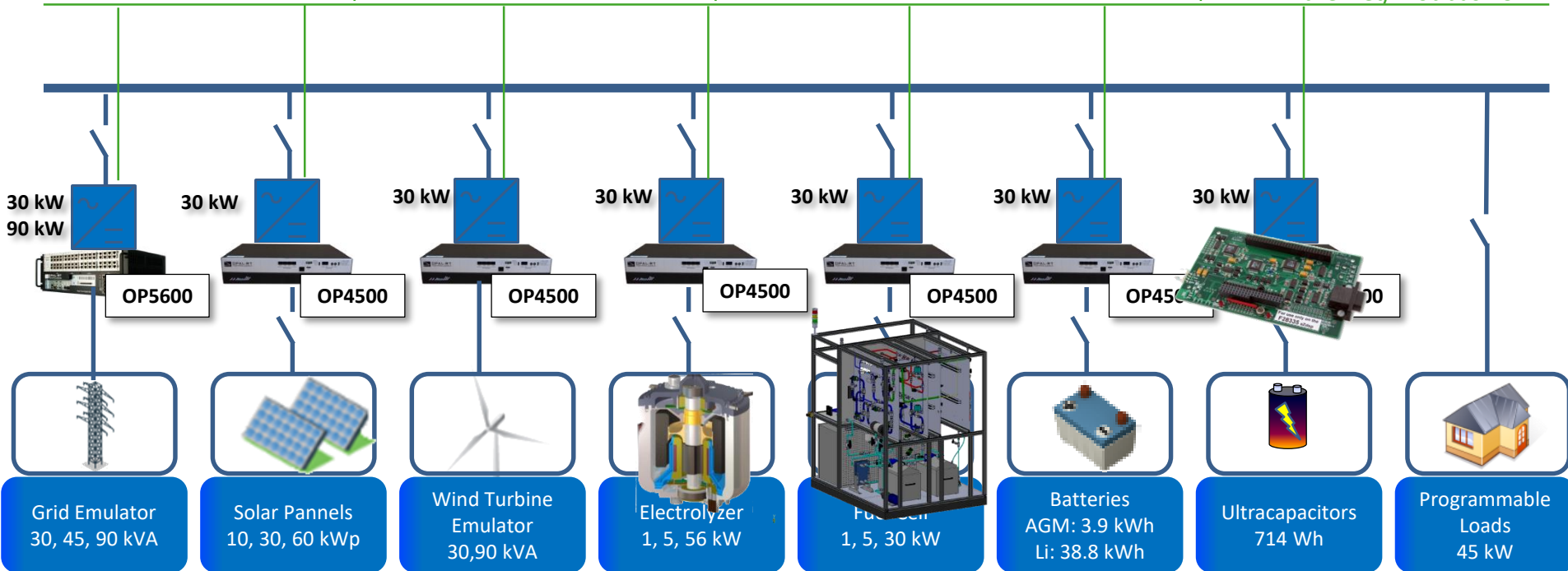


Opal-RT

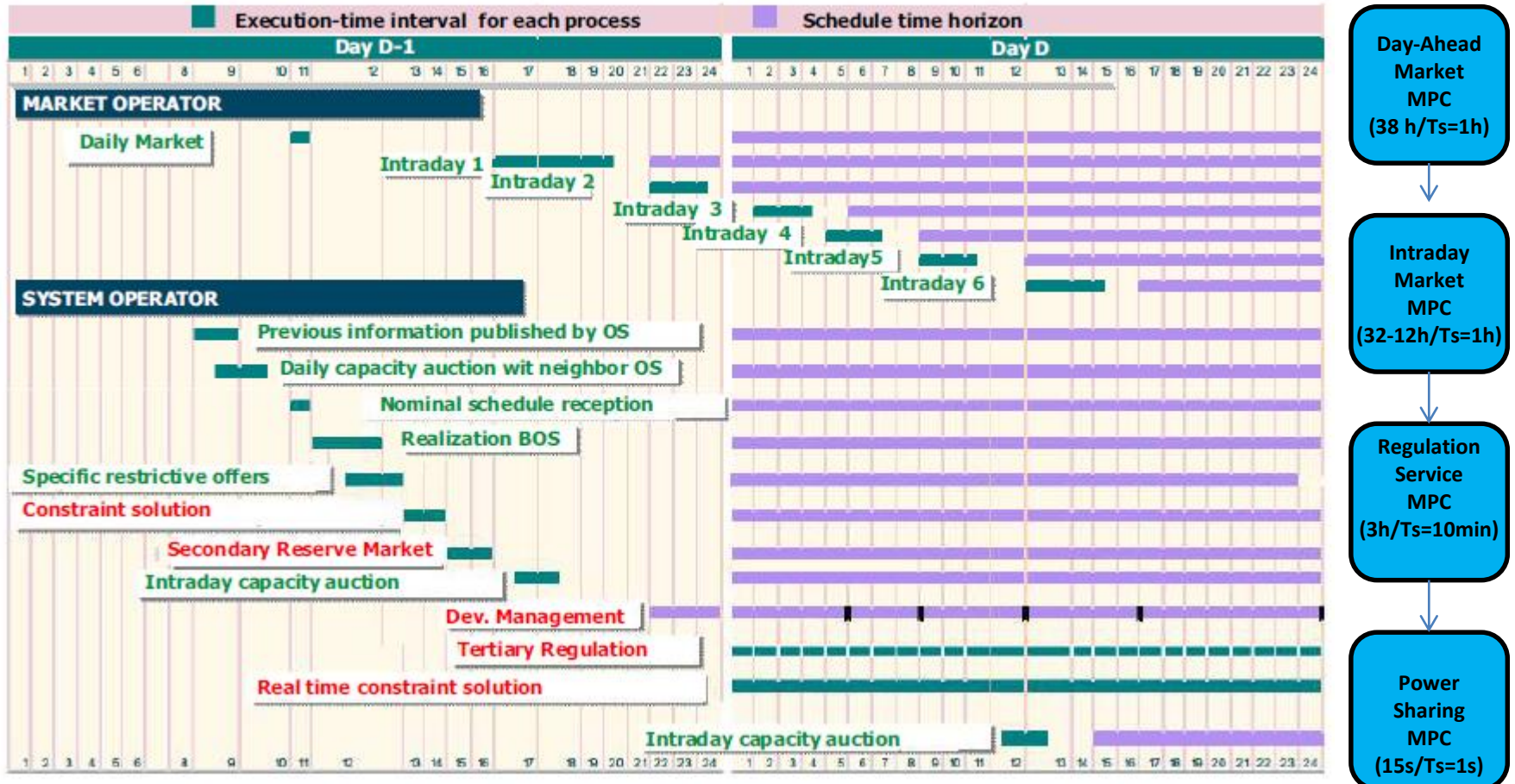


Tomlab -CPLEX

Ethernet/Modbus TCP-IP

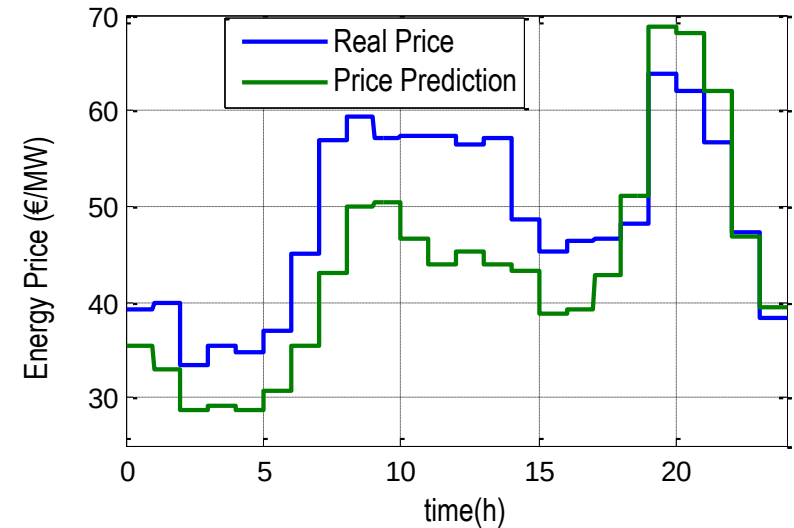
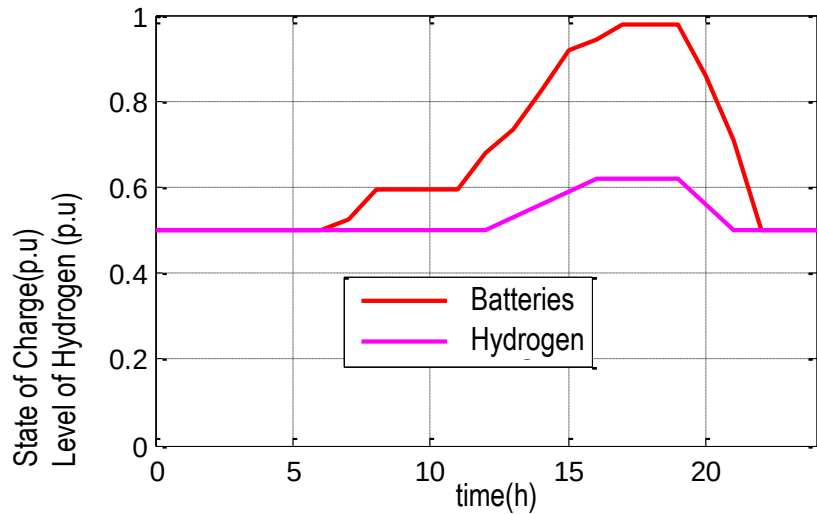
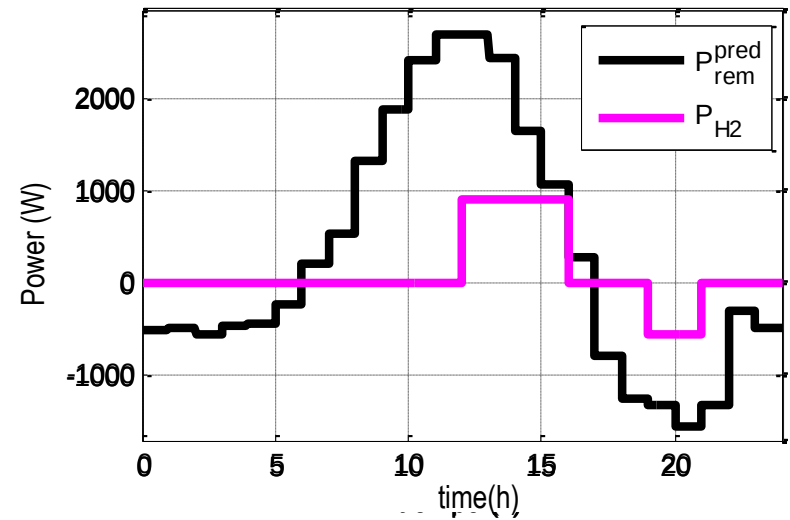
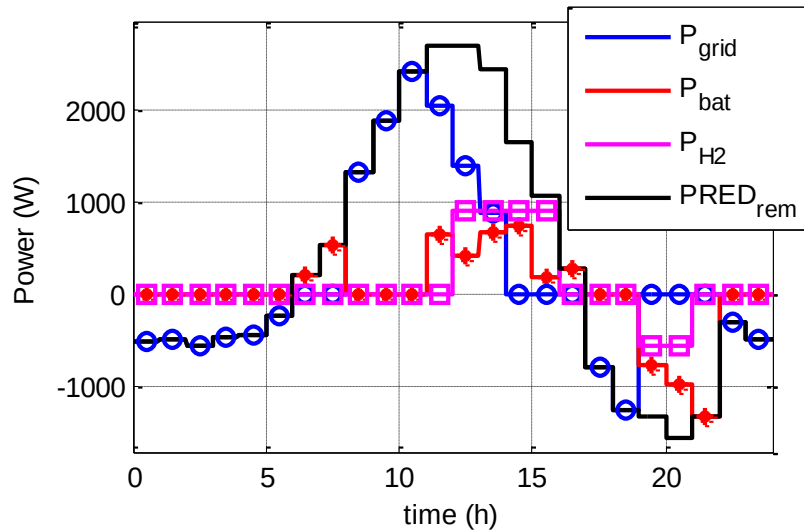


CONTROLADOR MPC DE 4 NIVELES

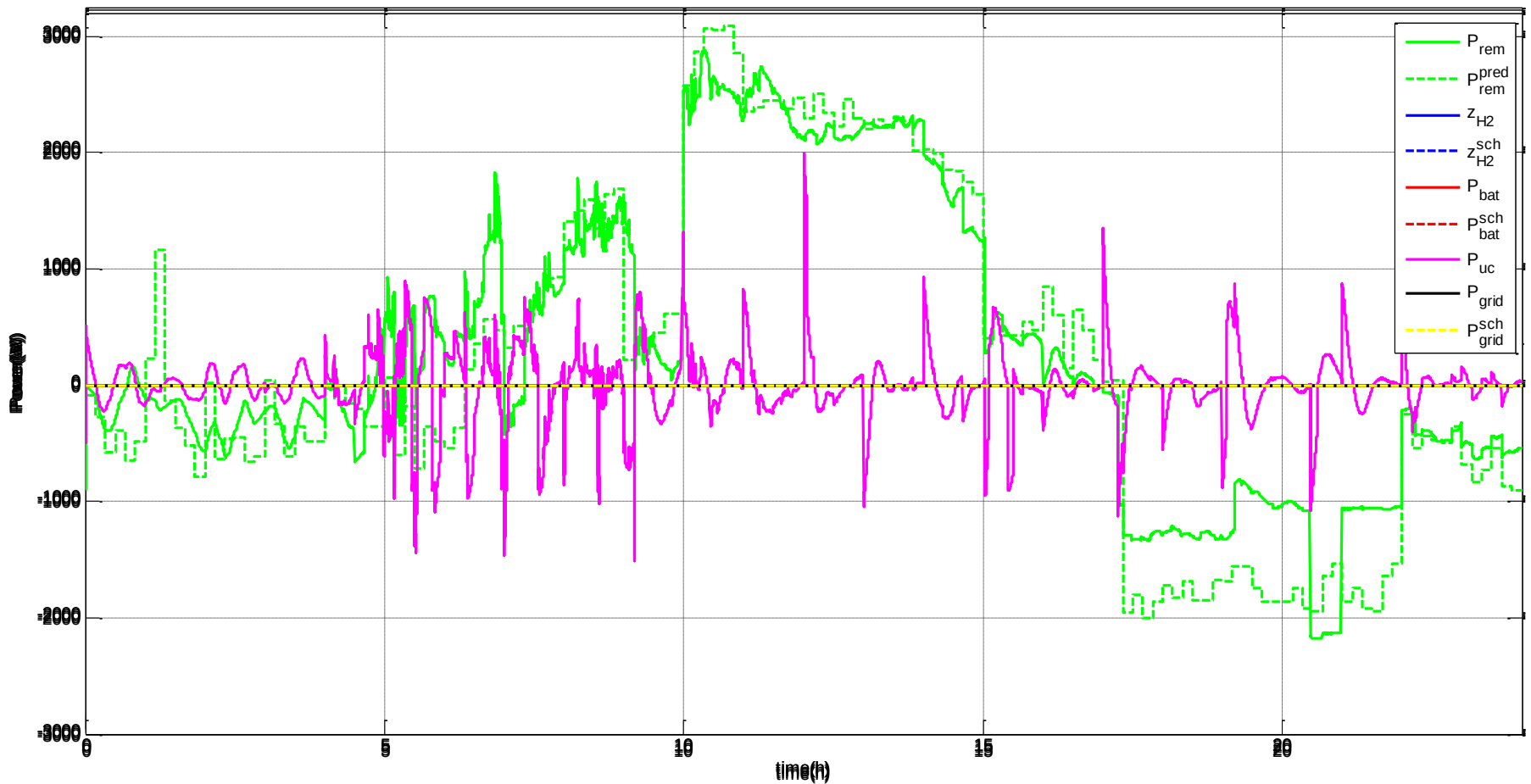


(*)Desarrollado bajo criterios de degradación mínima del sistema híbrido de almacenamiento de energía

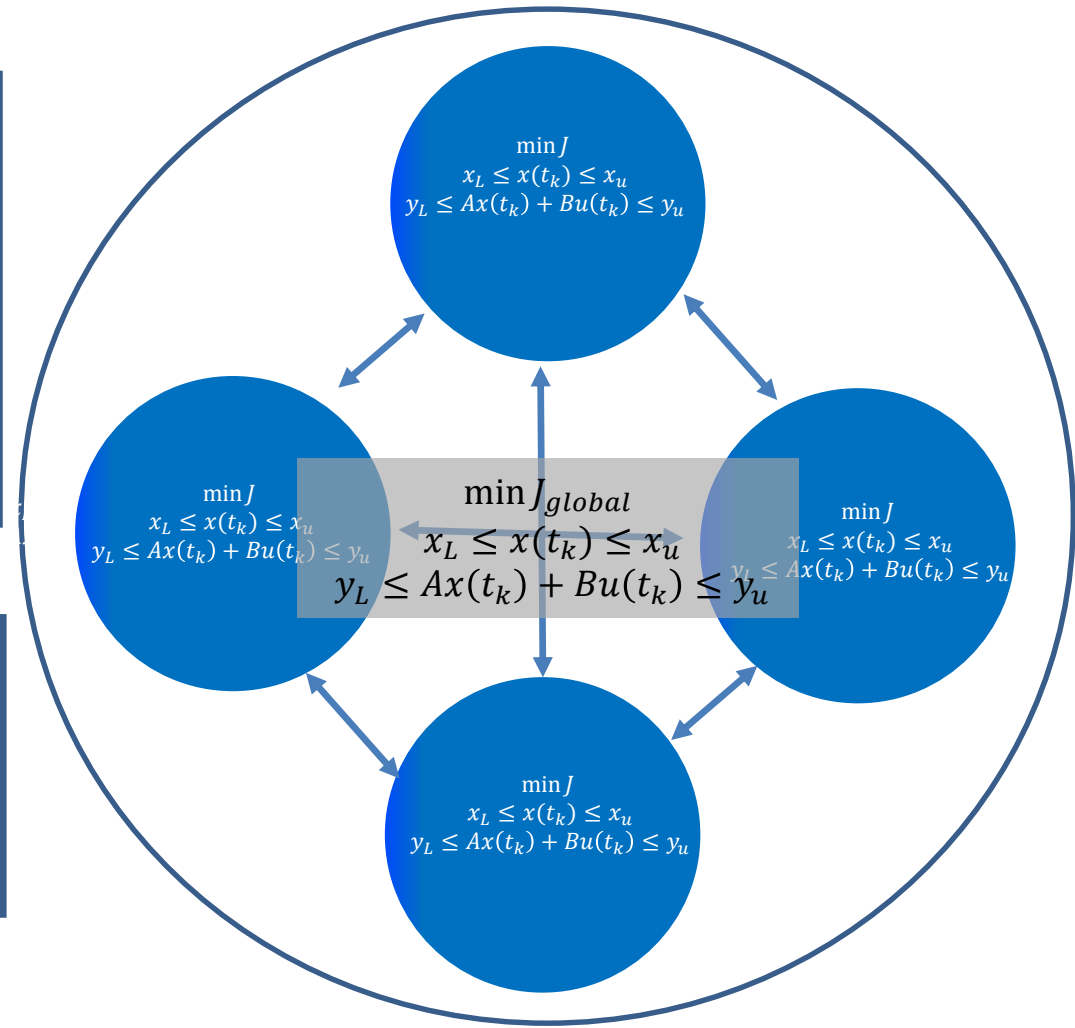
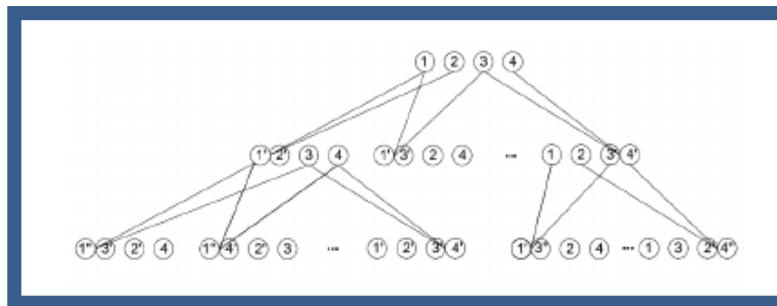
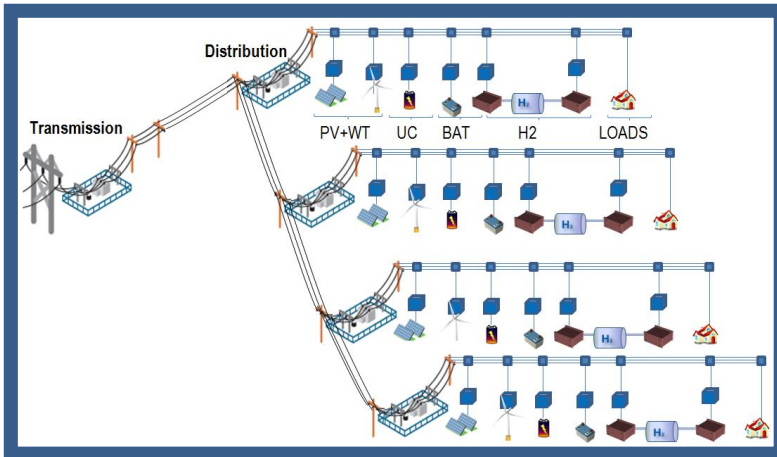
DAY-AHEAD MPC CONTROLLER



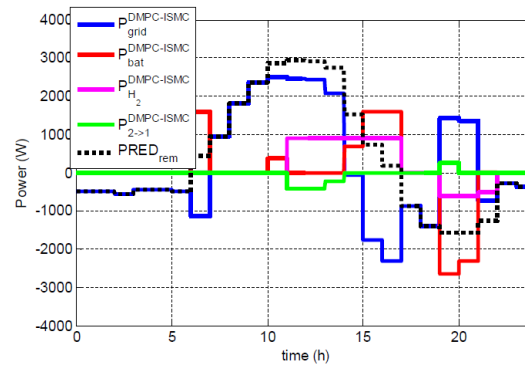
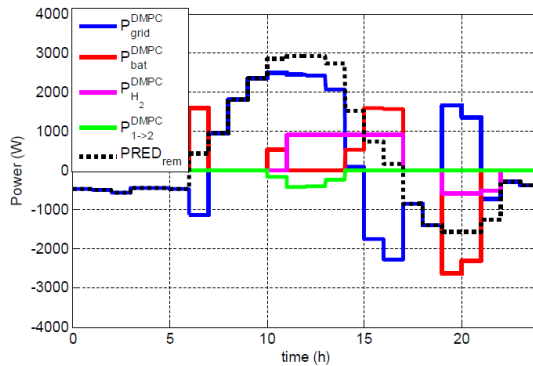
REAL TIME MPC CONTROLLER



MICRORREDES INTERCONECTADAS

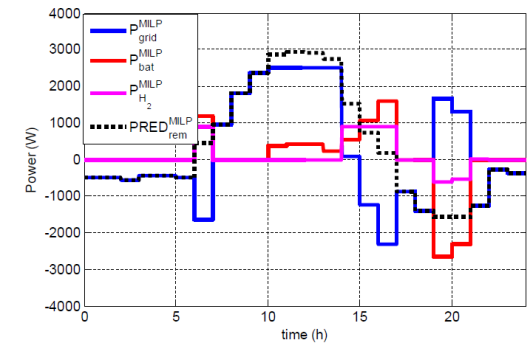
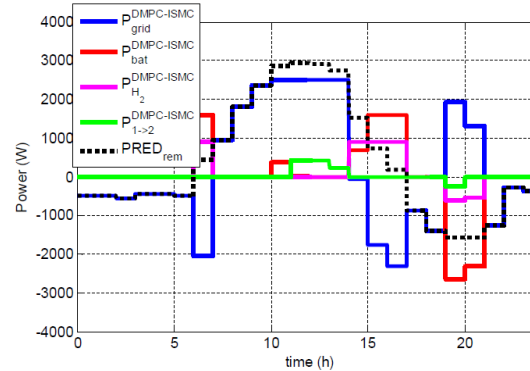
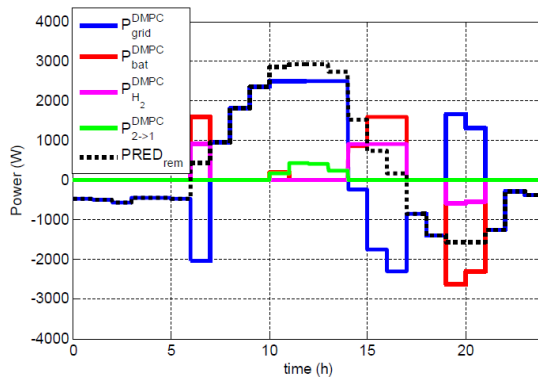


OPERACIÓN PEER TO PEER

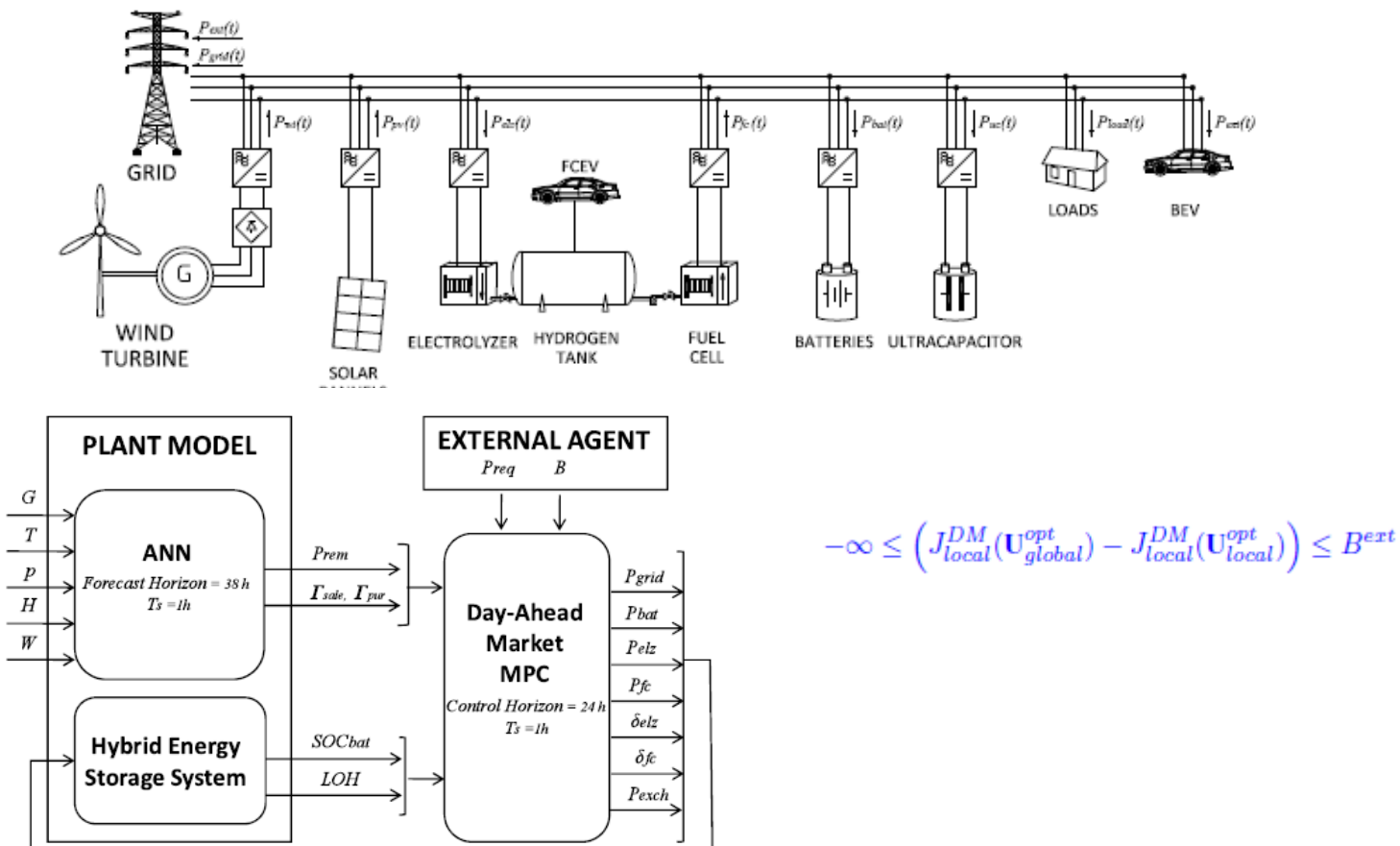


	MIQP	MILP	DMPC		DMPC-ISMIC	
$J_{degr,bat}^{(*)}$	0.0519	0.0526	0.0590	0.0597	0.0592	0.0592
$J_{degr,elz}^{(*)}$	0	0	0	0	0	0
$J_{degr,fc}^{(*)}$	0	0	0	0	0	0
J_{grid}	-0.1934	-0.1939	-0.2767	-0.1366	-0.2000	-0.2134
$J_{cc,bat}$	0.4950	0.4950	0.4950	0.4950	0.4950	0.4950
$J_{start,fc}$	0.0180	0.0180	0.0180	0.0180	0.0180	0.0180
$J_{start,elz}$	0.0148	0.0148	0.0074	0.0148	0.0148	0.0074
$J_{cc,elz}$	0.0296	0.0296	0.0444	0.0296	0.0296	0.0444
$J_{cc,fc}$	0.0036	0.0036	0.0054	0.0036	0.0036	0.0054
$J_{total,MIQP}^{(*)}$	0.4195	0.4197	0.3524	0.4841	0.4202	0.4160
$J_{total,MILP}$	-	0.4207	-	-	0.4207	0.4165

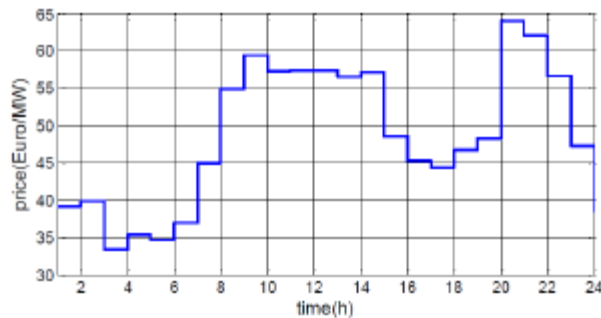
(*) Evaluated in the MIQP original form



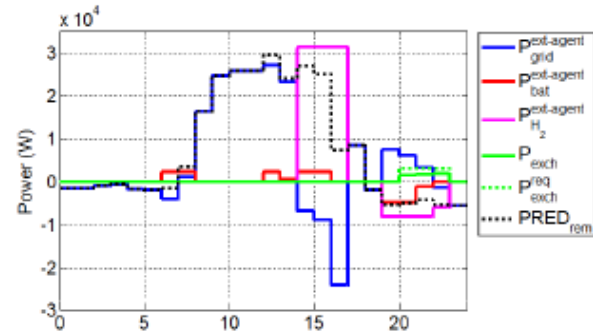
MPC MICRORREDES AGENTES EXTERNOS



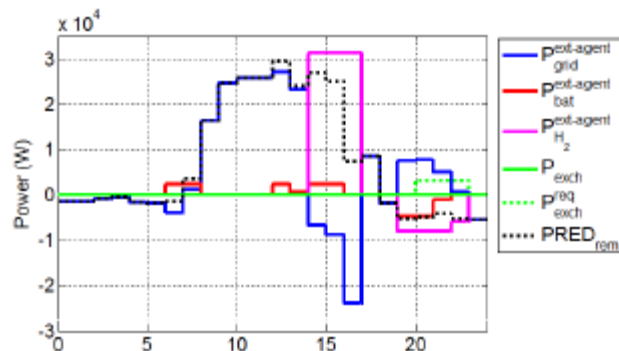
MPC MICRORREDES AGENTES EXTERNOS



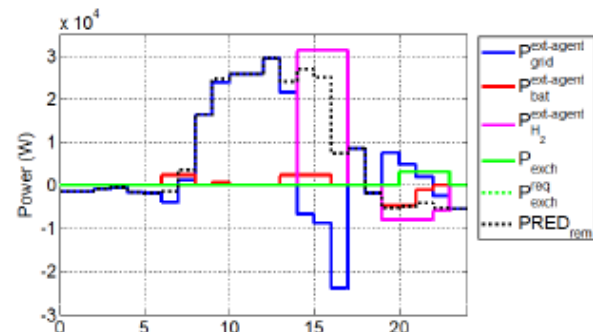
Price forecast for the sale of energy in the day-ahead market per hour



Optimization results for the day-ahead of the microgrid with external agents at $B = 1$ €

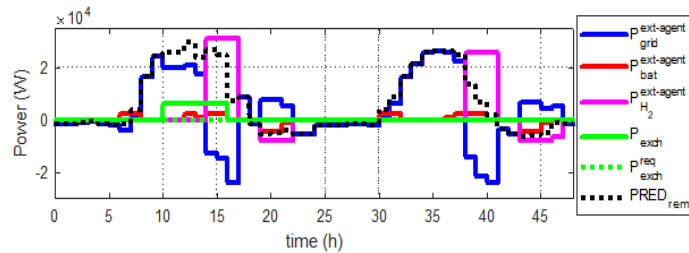
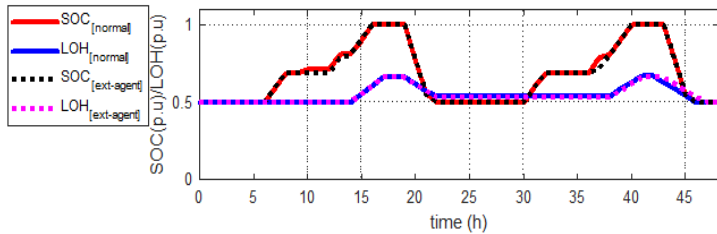
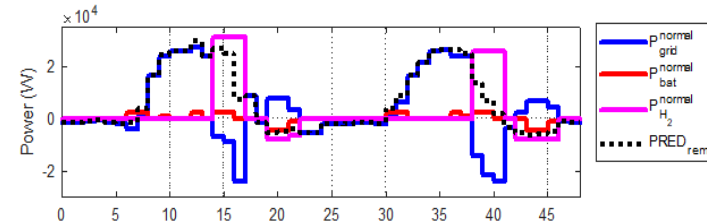
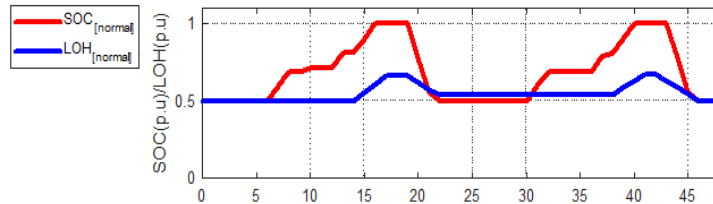


Optimization results for the day-ahead of the microgrid as single system or with external agents at $B = 0$ €

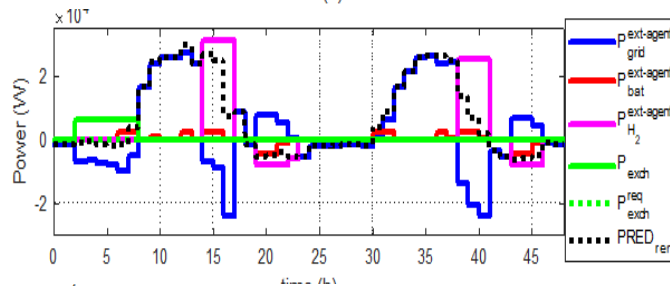
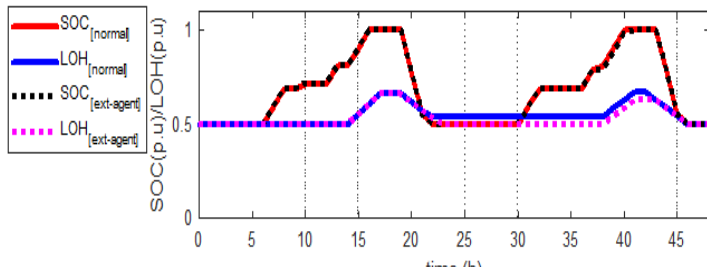


Optimization results for the day-ahead of the microgrid with external agents at $B = 3$ €

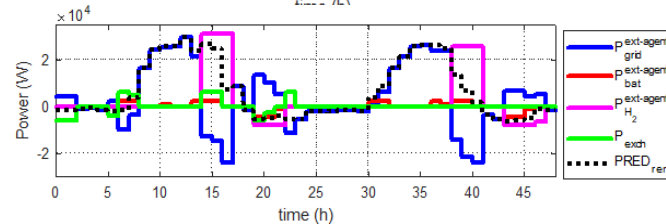
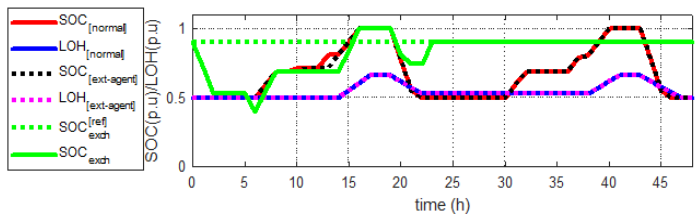
LOAD SHIFTING/LOAD CURTAILMENT



$B_{\text{ext}} = 1.919 \text{ €}$



$B_{\text{ext}} = 3.5261 \text{ €}$



$B_{\text{ext}} = 2.5737 \text{ €}$



V CONGRESO **SMART GRIDS** Madrid, 13 Diciembre 2018

DATOS DE CONTACTO:

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CENTRO NACIONAL DEL HIDRÓGENO

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CONFIGURA: *Control Predictivo de Microrredes
Reconfigurables con Almacenamiento Híbrido y
Móvil (DPI2016-78338-R)*

