

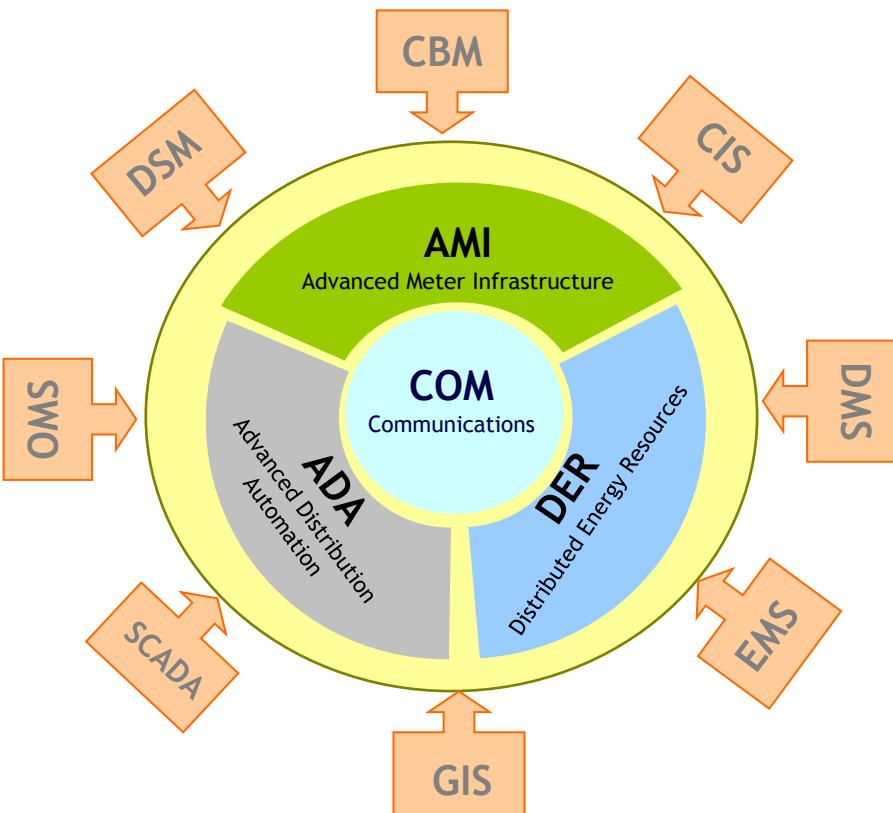


II CONGRESO
SMART GRIDS
Madrid 27-28 Octubre 2014

**UN NUEVO PARADIGMA EN LA
GENERACIÓN DISTRIBUIDA BASADO EN
MULTI-AGENTES**

Felipe Alvarez-Cuevas Figuerola, Endesa

ARQUITECTURA CONCEPTUAL

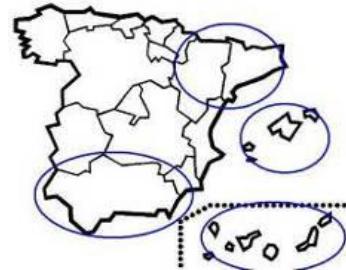


FUNCTION TYPE	FUNCTION CLASS	CLASS MODE	Value/signal	Transfer time (*)	Availability in Grid State	Reliability level
SEN management function	Active Protection Functions (@ HV/MV-MV/LV level)	APF	Block & trip Signal	<=20ms	Normal Perturbed Crisis	Very High
	Command Control & Regulation	CMD	O/C command Load shedding Peak shaving	<=2s	Normal Perturbed Crisis	High
	Monitoring & Analysis	MON	Analogical & Digital TVPP	>=2s	Normal Perturbed Crisis	High
Advanced meter function	Advanced Meter & Supply Management function (Commercial functionalities)	AMS	Energy meas., Supply mngt. Command, Alarm signals	<=5m -----<=10s	Normal	Low
Active Demand DR functions	End to End Information Exchange and Management	IEM	Energy meas., CVPP/Load Other signals	<=5m <=5s	Normal Perturbed	Medium

MOTIVACIÓN



1600 Primary Substations
(All automated)



160.000
Secondary Substations
(currently 9.000 automated)



Now

Coming Soon



$$8 \text{ Mill} \Rightarrow 80 \text{ GW} \times 6 \text{ h} = 480 \text{ GWh}$$



$$28 \text{ Mill} \Rightarrow 280 \text{ GW} \times 1 \text{ h} = 280 \text{ GWh}$$

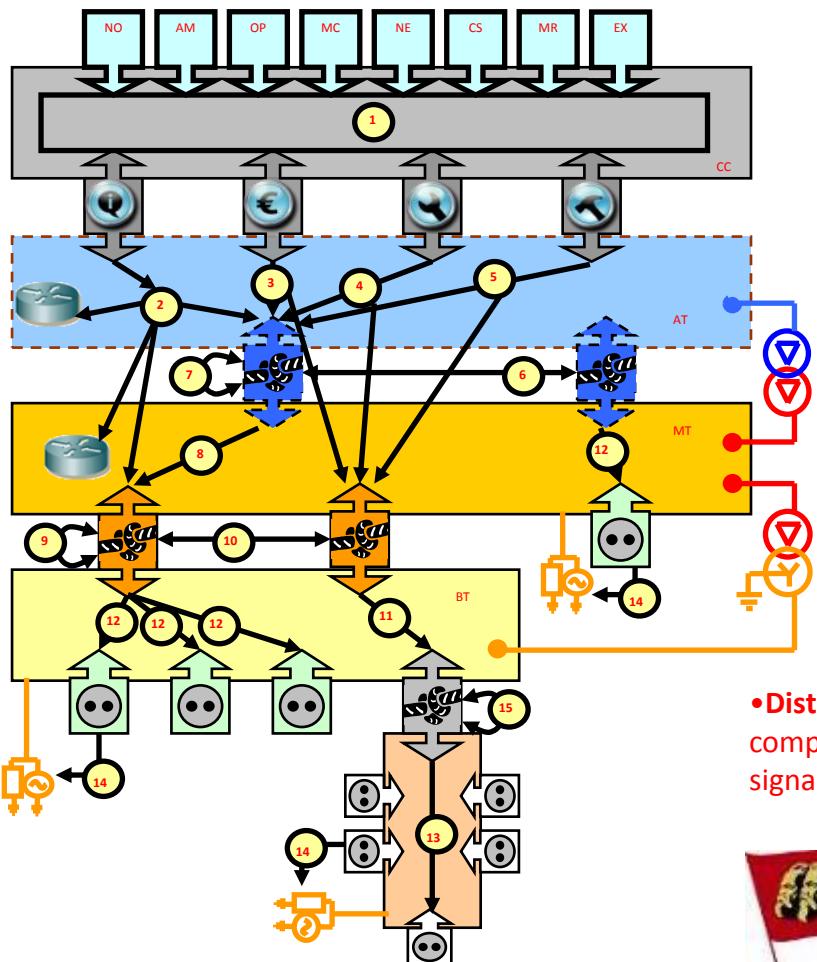


$$11 \text{ Mill} \Rightarrow ?$$



$$6 \Rightarrow 6 \text{ Gw} \times 24\text{h}= 144 \text{ GWh}$$

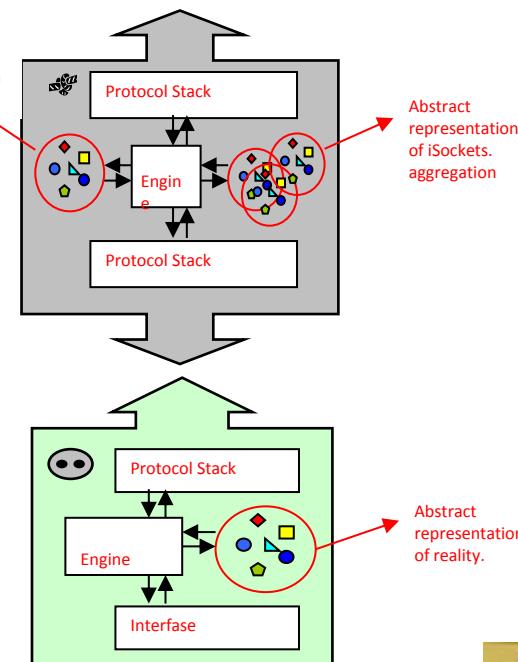
ARQUITECTURA DE REFERENCIA



Distributed: (or capitalist model) the controllers are completely independent and they use uniquely the price signals to control the connected electrical devices.



Centralised: (or communist model) the controllers send data to the attached iNode regarding their concrete reality abstraction and the iNode is the responsible for planning the performed actions.



METODOLOGÍA

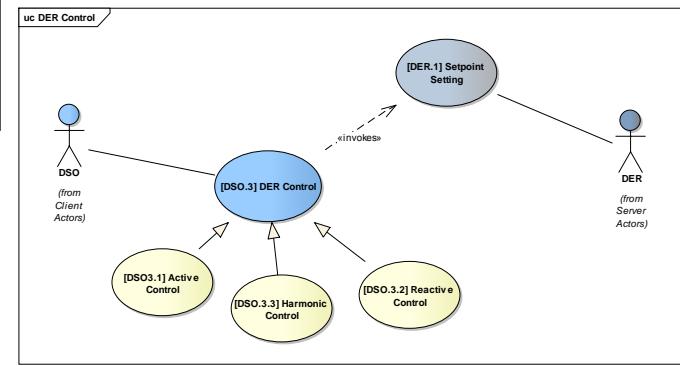
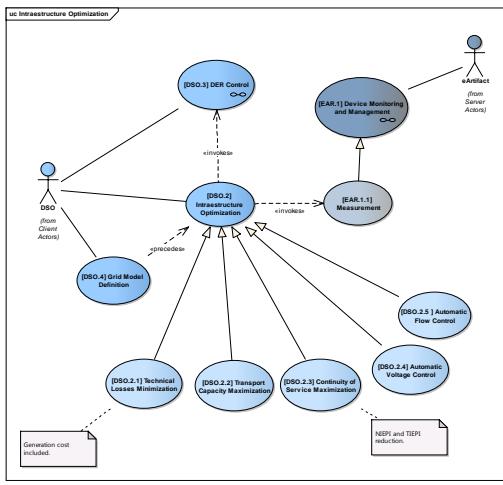
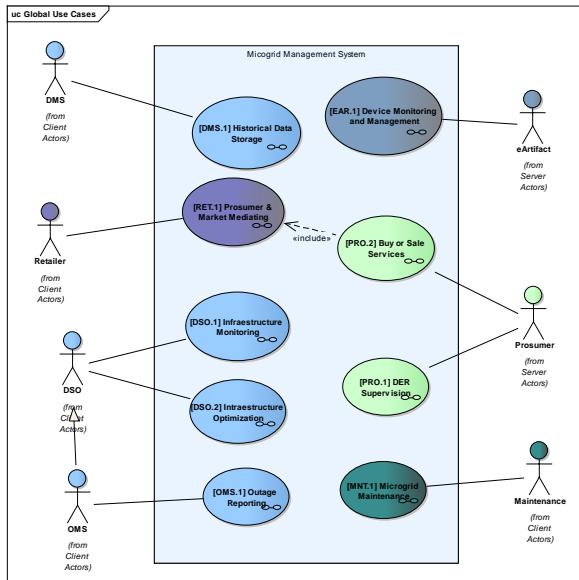
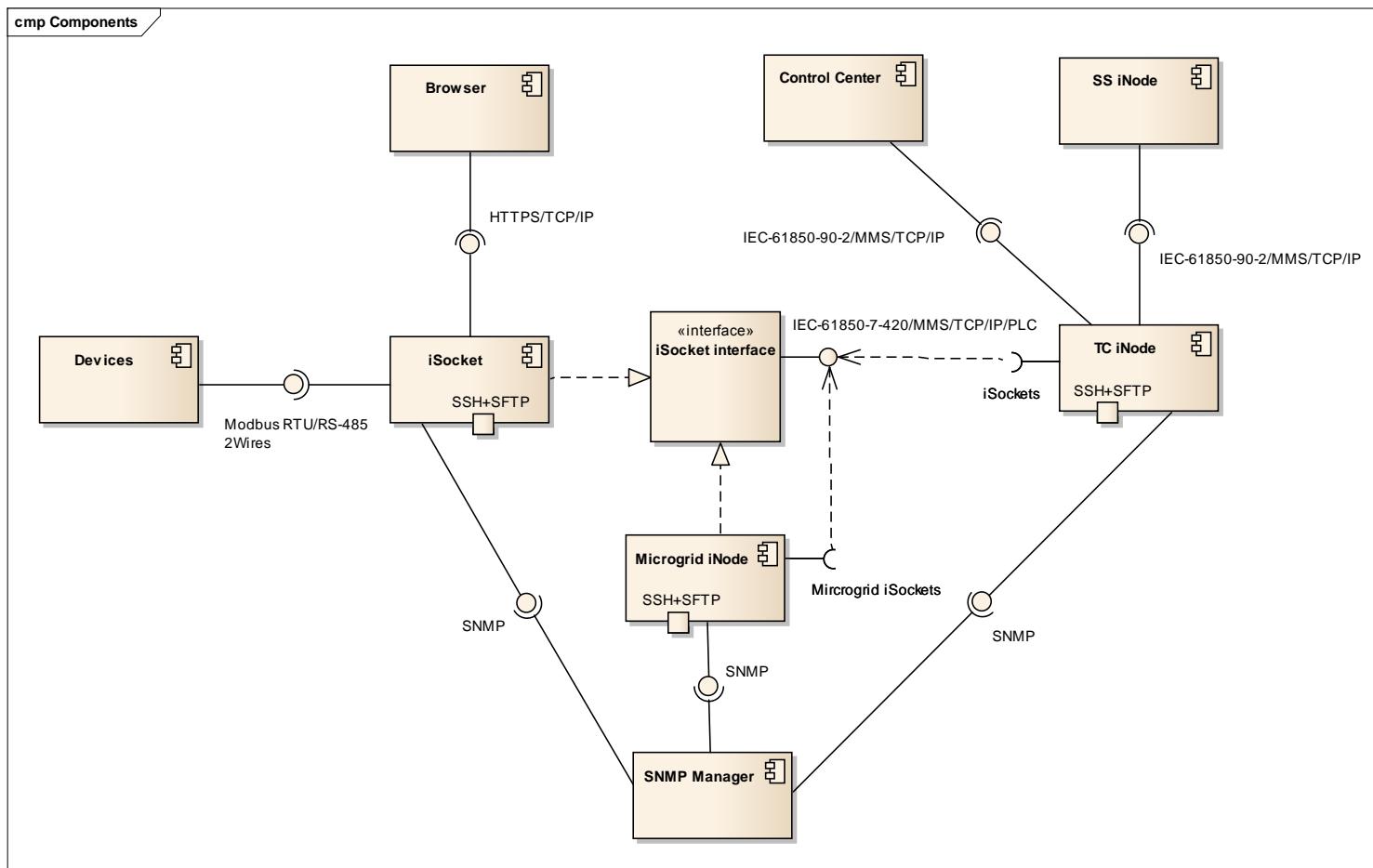


DIAGRAMA DE BAJO NIVEL

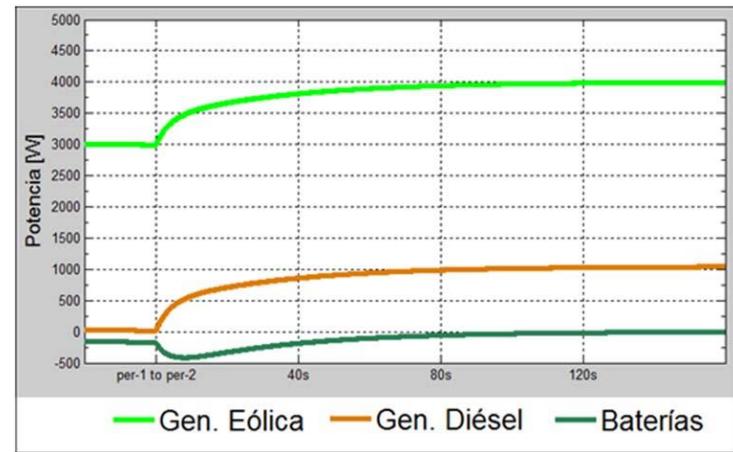
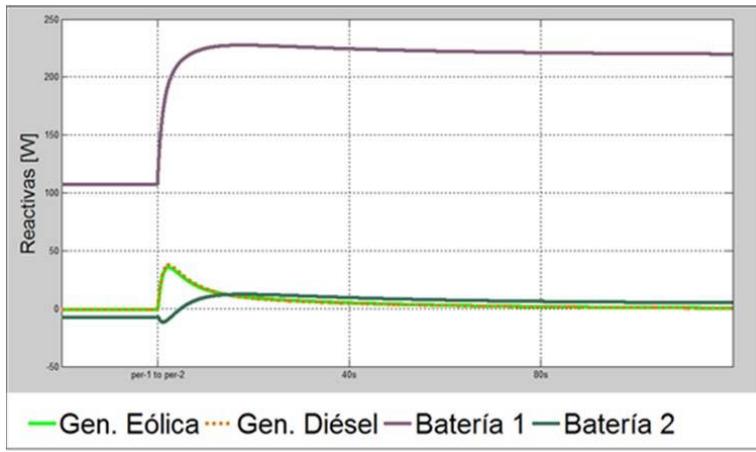


RESULTADOS (PARÁMETROS)

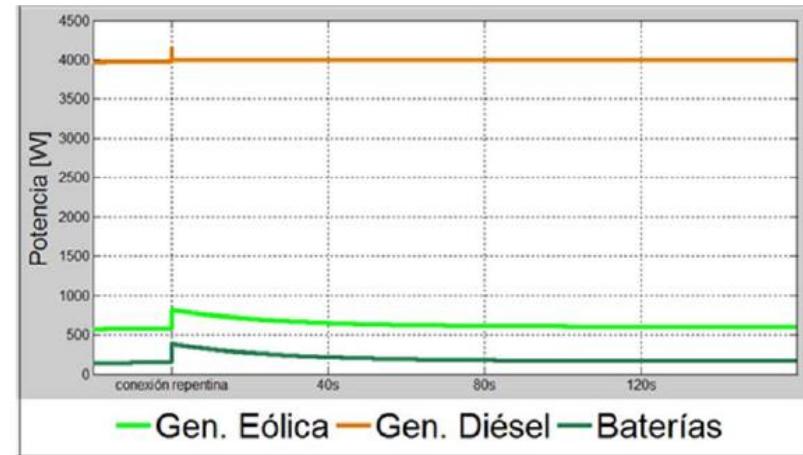
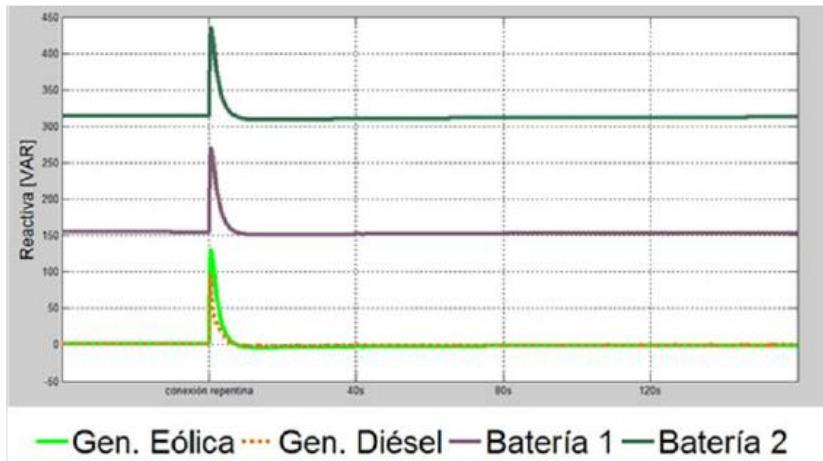
- Un generador eólico con una potencia nominal de 4kW.
- Un grupo electrógeno diésel con una potencia de 4 kW.
- Dos conjuntos de baterías idénticas con una capacidad de 1kWh y un rendimiento del 90%. El conversor es de 500 VA y su estado inicial es del 50%.
- La red:
 - Con carga puramente resistiva variable de 20Ω, 35Ω, 40Ω, 45Ω.
 - Con carga constante inductiva de 84 mH.

	periodo 1	periodo 2	periodo 3	periodo 4
P _{gen1} [W]	2976	4000	600	0
P _{gen2} [W]	0	1129.44	4000	0
P _{bat1} [W]	-185	0	166	0
P _{bat2} [W]	-185	0	166	0
P _{red} [W]	0	0	3229	5032
P _{total} [W]	2606	5129	8129	5032
Q _{gen1} [VAr]	0	0	0	0
Q _{gen2} [VAr]	0	0	0	0
Q _{bat1} [VAr]	108	219	153	217
Q _{bat2} [VAr]	-6	4	312	0
Q _{red} [VAr]	0	0	0	0
Q _{total} [VAr]	101	224	468	217

RESULTADOS (SEGUIMIENTO DE CONSIGNAS)



RESULTADOS (CAMBIO REPENTINO)





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MUCHAS GRACIAS

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