



Smart TSO-DSO interaction schemes, market architectures and ICT  
Solutions for the integration of ancillary services from demand side  
management and distributed generation

SmartNet Workshop Series | 2018/10/24-26

The three technological pilot projects

Carlos Madina (Tecnalia)

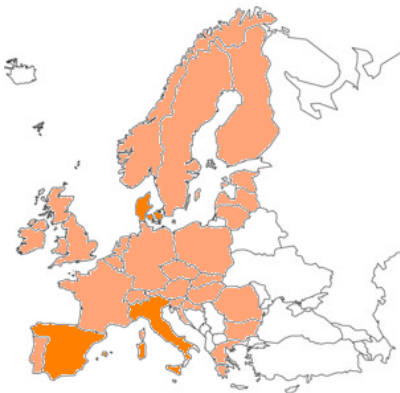


This project has received funding from the European Union's Horizon 2020  
research and innovation programme under grant agreement No 691405



***Realisation of three complementary pilots to evaluate the performance of different TSO-DSO interactions under different market structures.***

***Coordination with laboratory simulations to bridge the gap between present real-world implementation and the opportunities envisaged for the future.***



***Identify & remove barriers to facilitate the way to the pan-European market for ancillary services.***

## Centralised TSO control in high-DER area

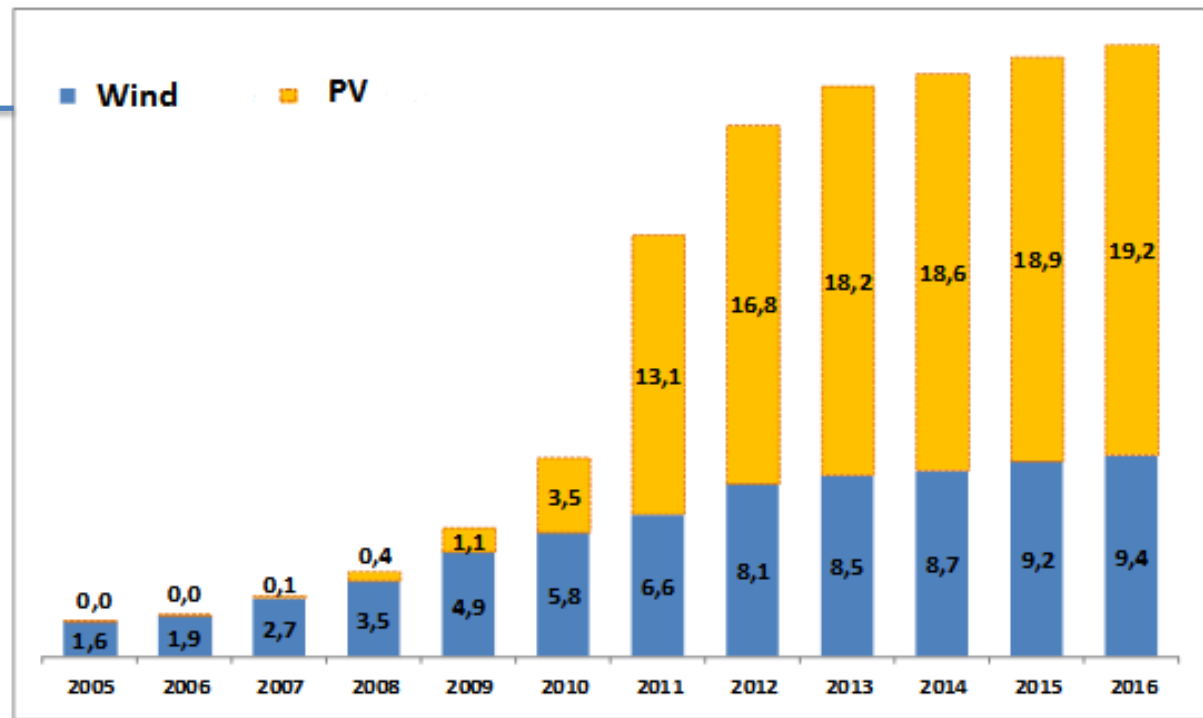


# Italian context: Energy situation

Large increasing of  
RES in the last 10  
years



New issues in terms  
of power  
management of the  
electrical grid



Active  
power rise  
from MV up  
to HV grid

Difficulty to  
predict RES  
production



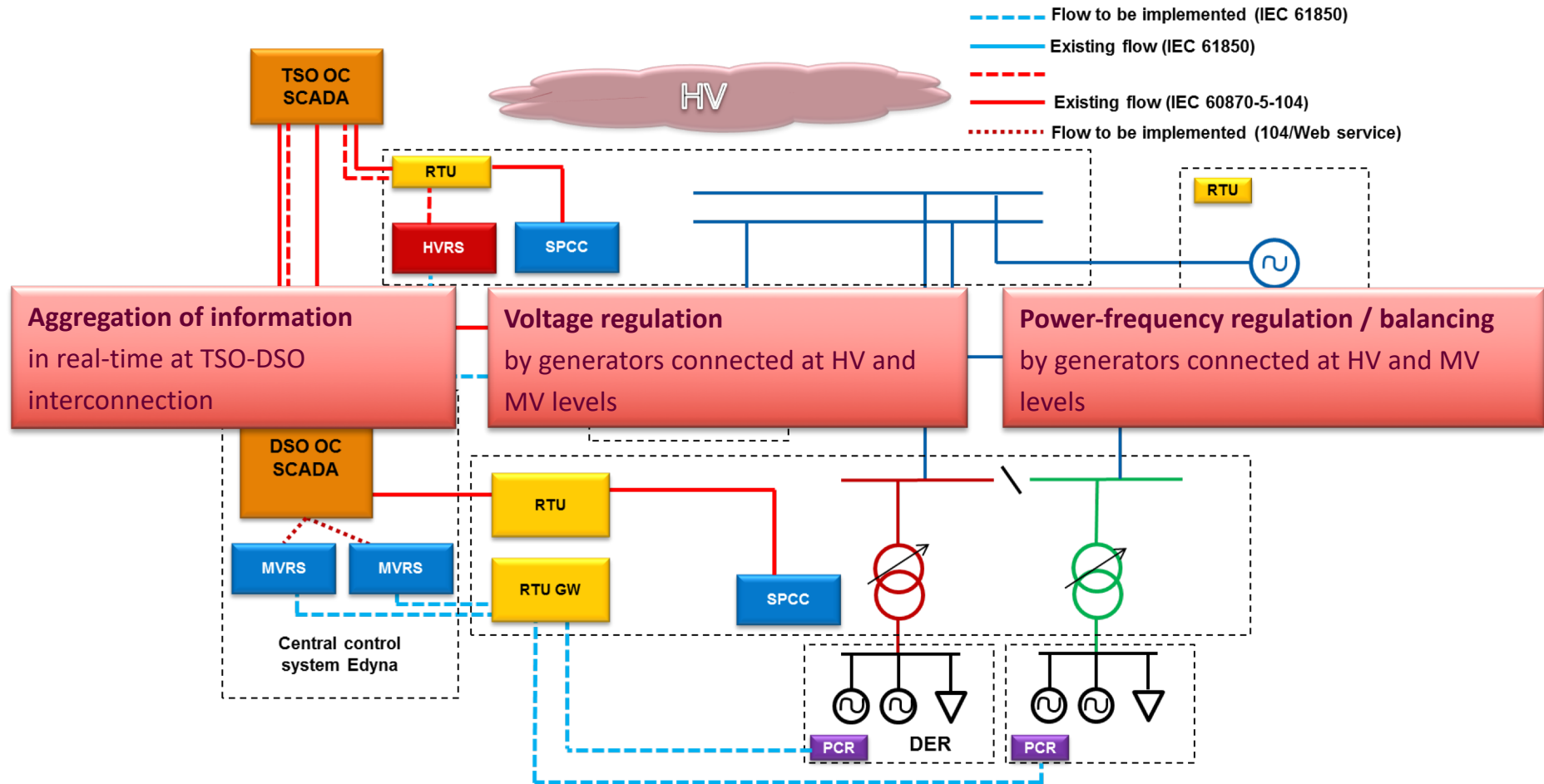
Italian NRA is opening the market to DG and DR  
through *aggregators* and requiring the DSO to  
improve *observability* for the TSO

Needs to improve the infrastructure for monitoring and control of MV and LV levels



# Pilot A: Centralised TSO control in high-DER area

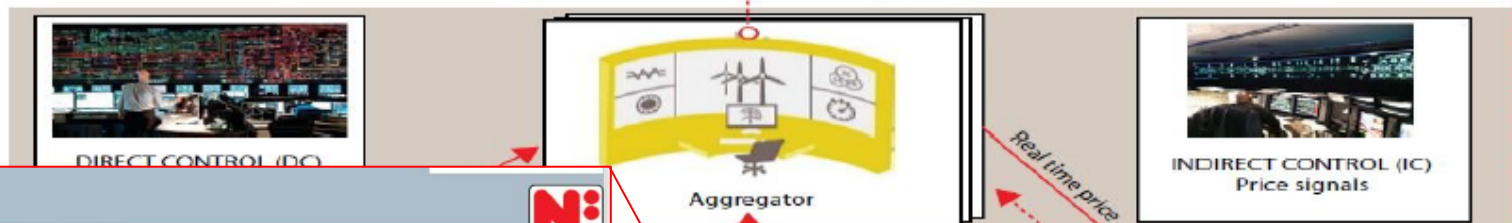
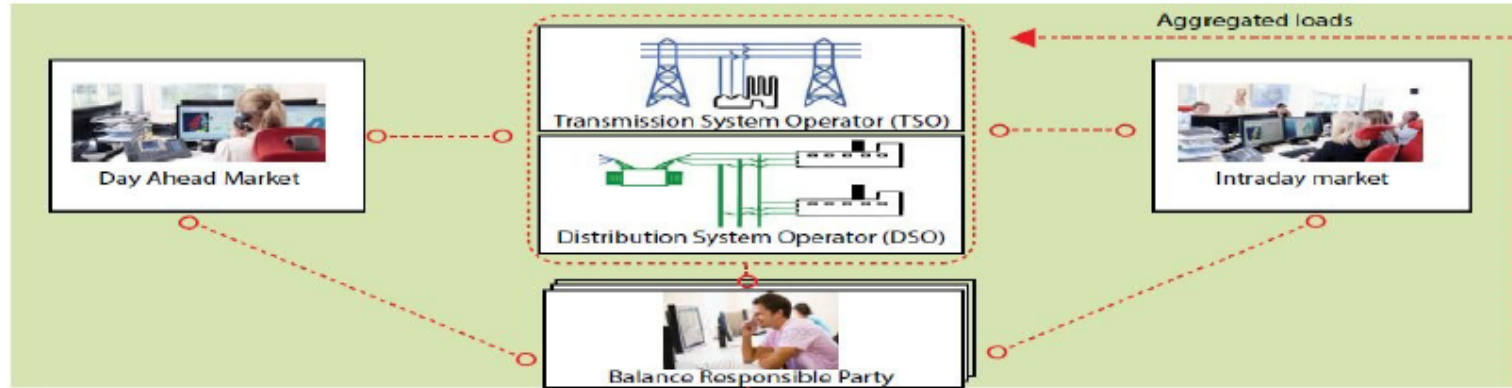
Centralized AS market model



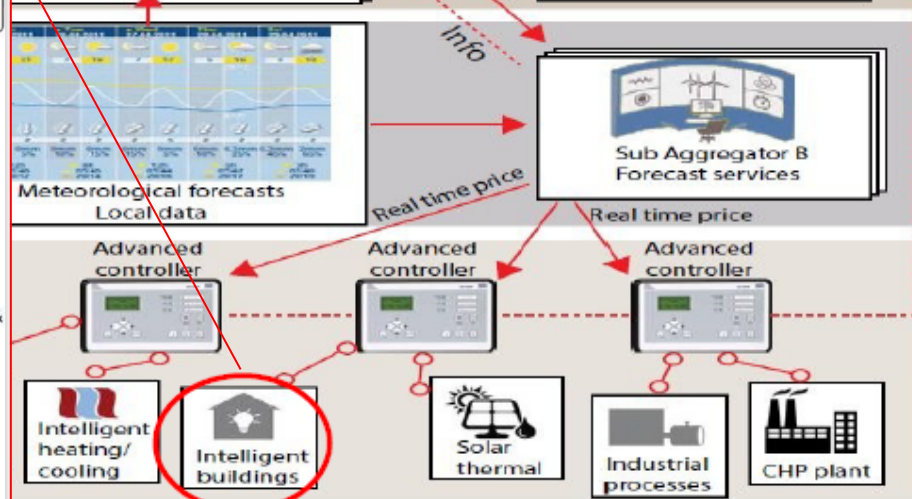
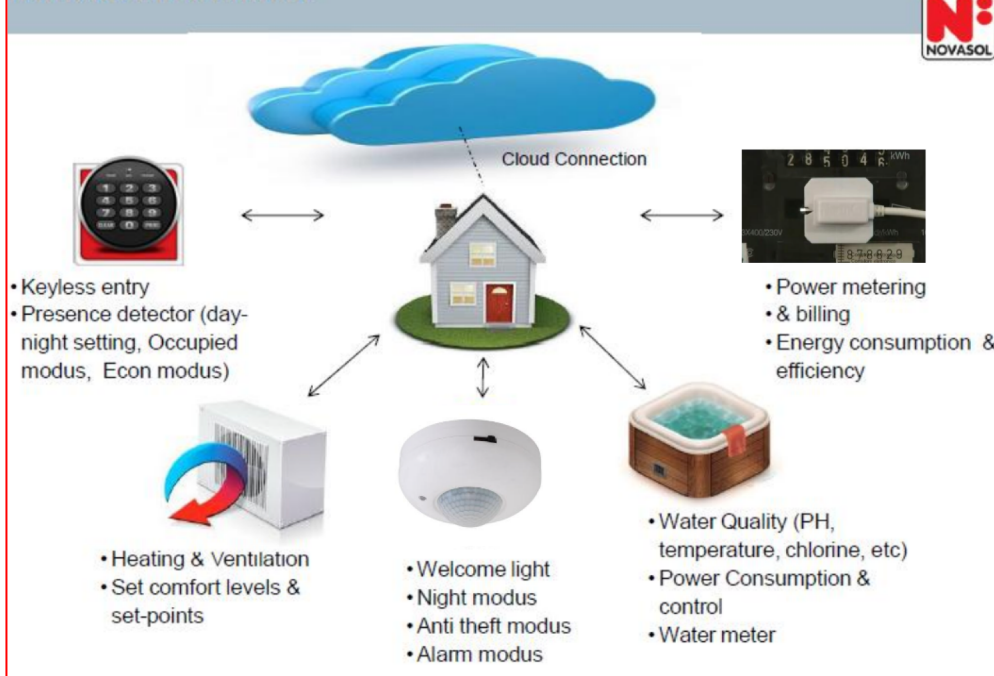
## Common TSO-DSO market with pool flexibility



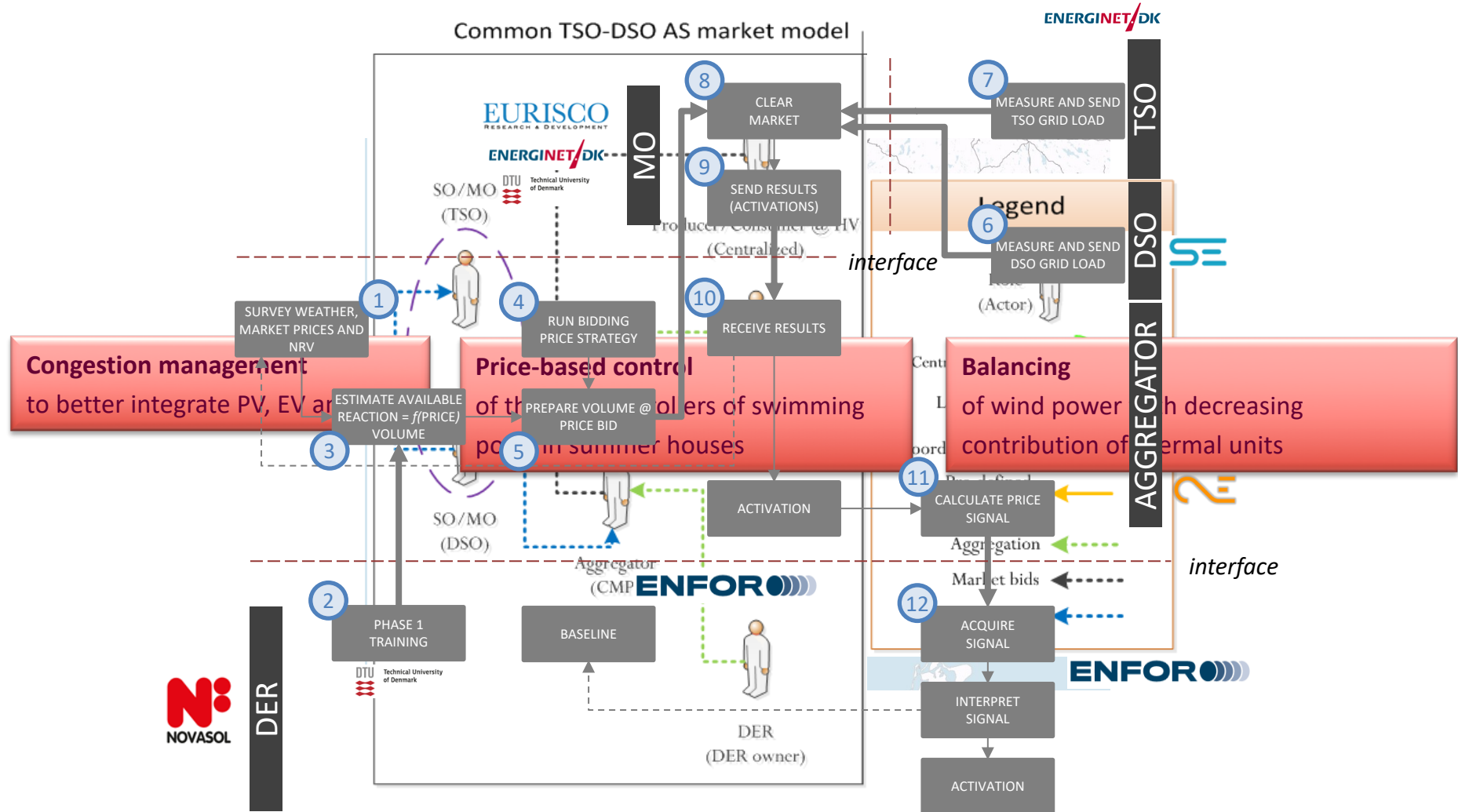
# Smart Energy Operating System (SE-OS)



## Novasol Smart house



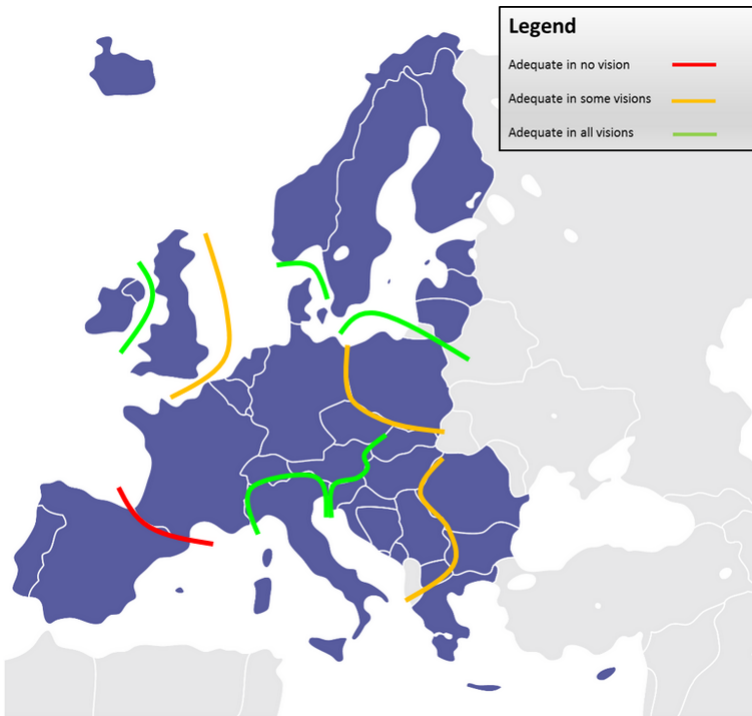
# Pilot B: Common TSO-DSO market with pool flexibility



## Shared responsibility with base station flexibility

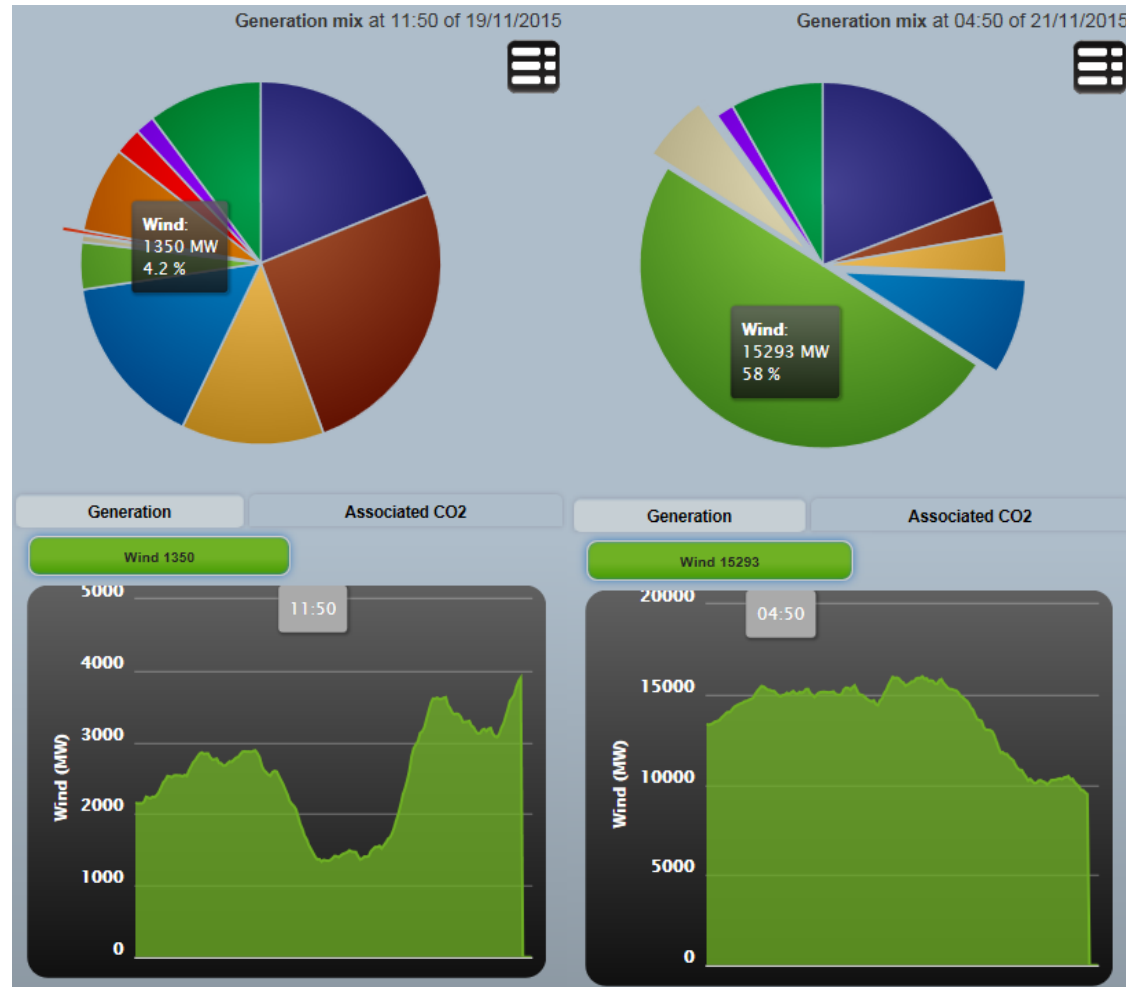


# Spanish context



2030 Transmission adequacy (TYNDP'16)

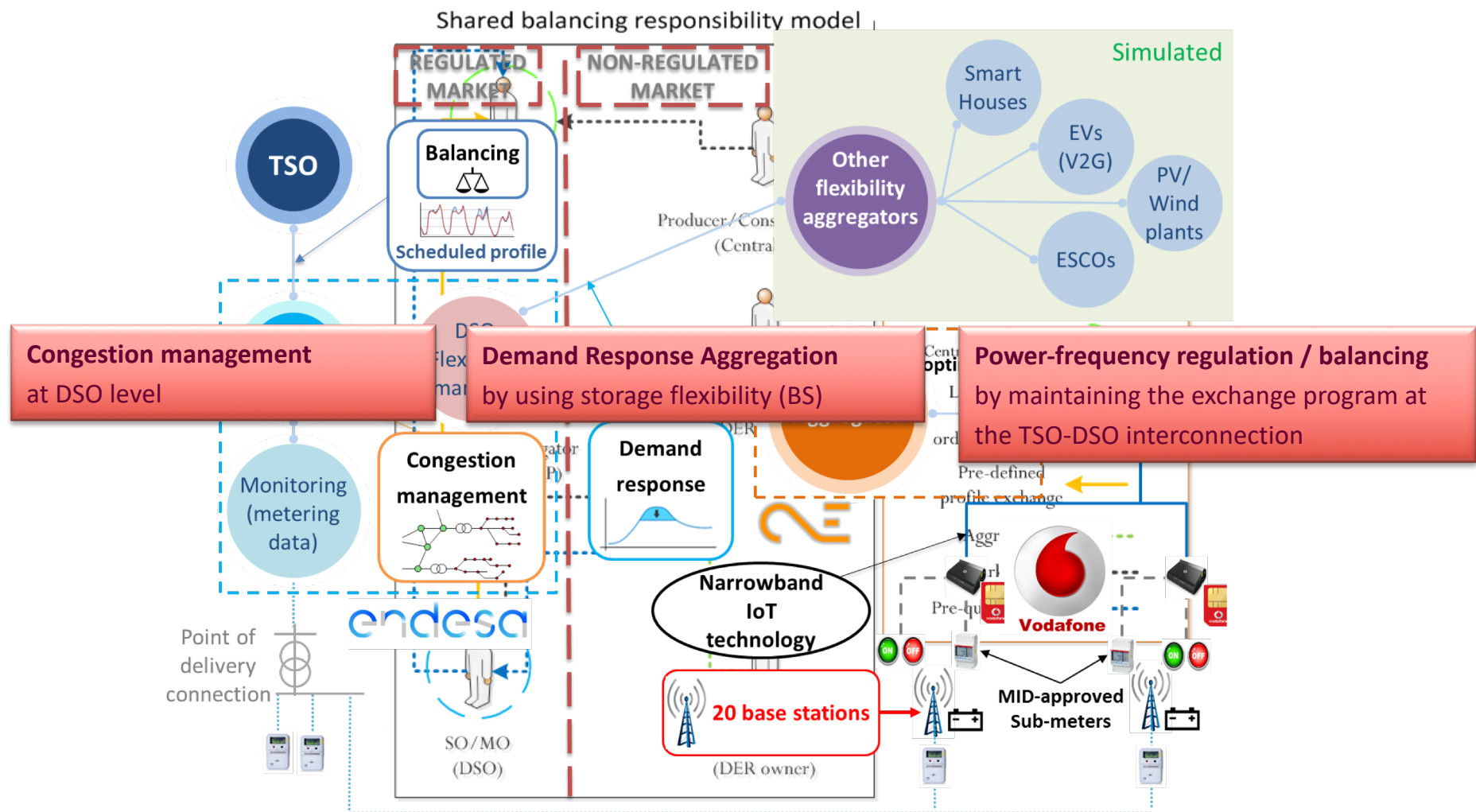
<http://tyndp.entsoe.eu/exec-report/>



Poor interconnections

Big contribution by highly-variable RES production

# Pilot C: Shared responsibility with BS & EV flexibility





# SmartNet



[SmartNet-Project.eu](http://SmartNet-Project.eu)

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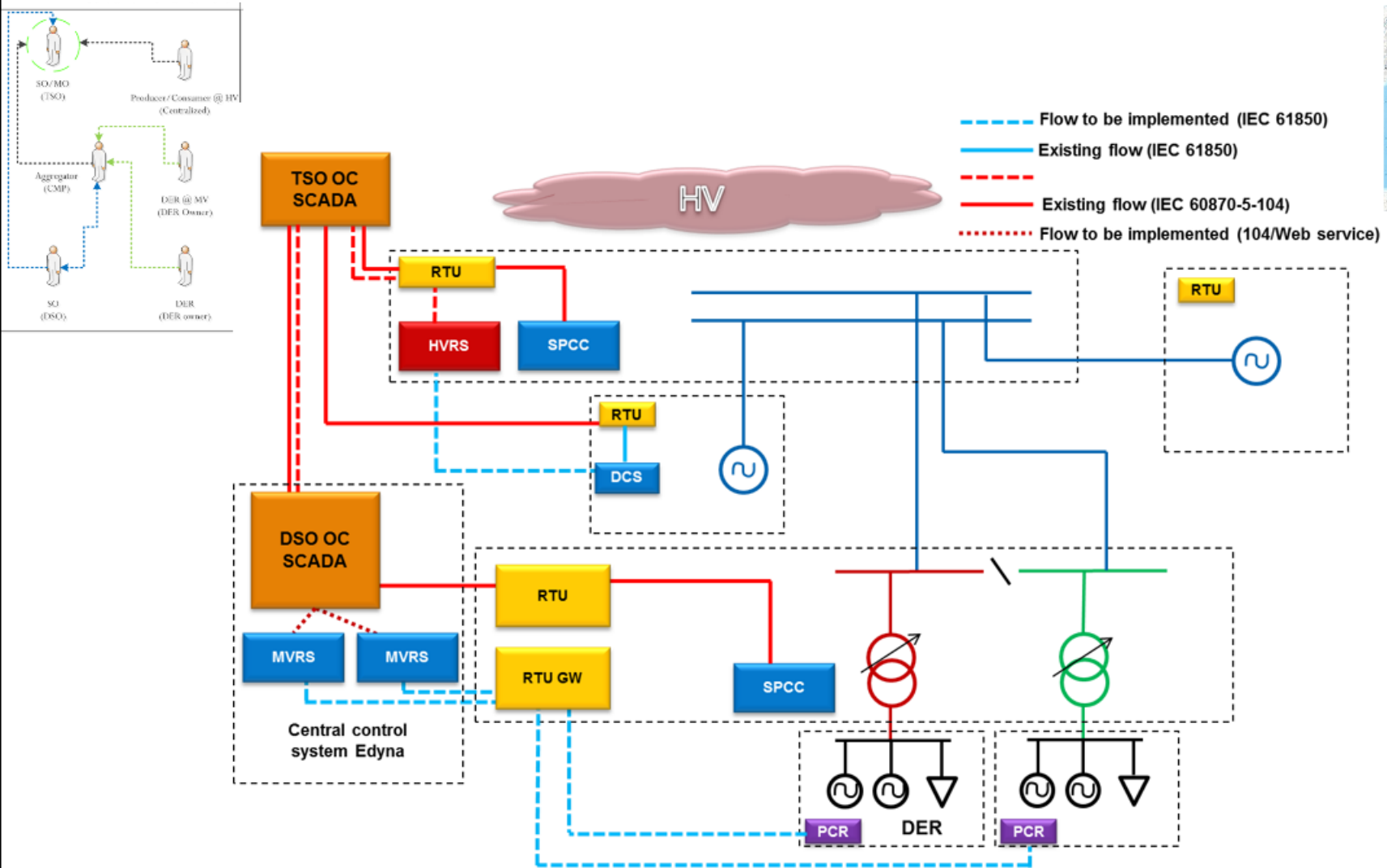
Thank You

Carlos Medina

**Contact Information**

Affiliation:	Tecnalia
Phone:	+34 667 165 473
Email:	<a href="mailto:carlos.madina@tecnalia.com">carlos.madina@tecnalia.com</a>

# Pilot A: Back-up slide



**Aggregation of information**  
in real-time at TSO-DSO  
interconnection

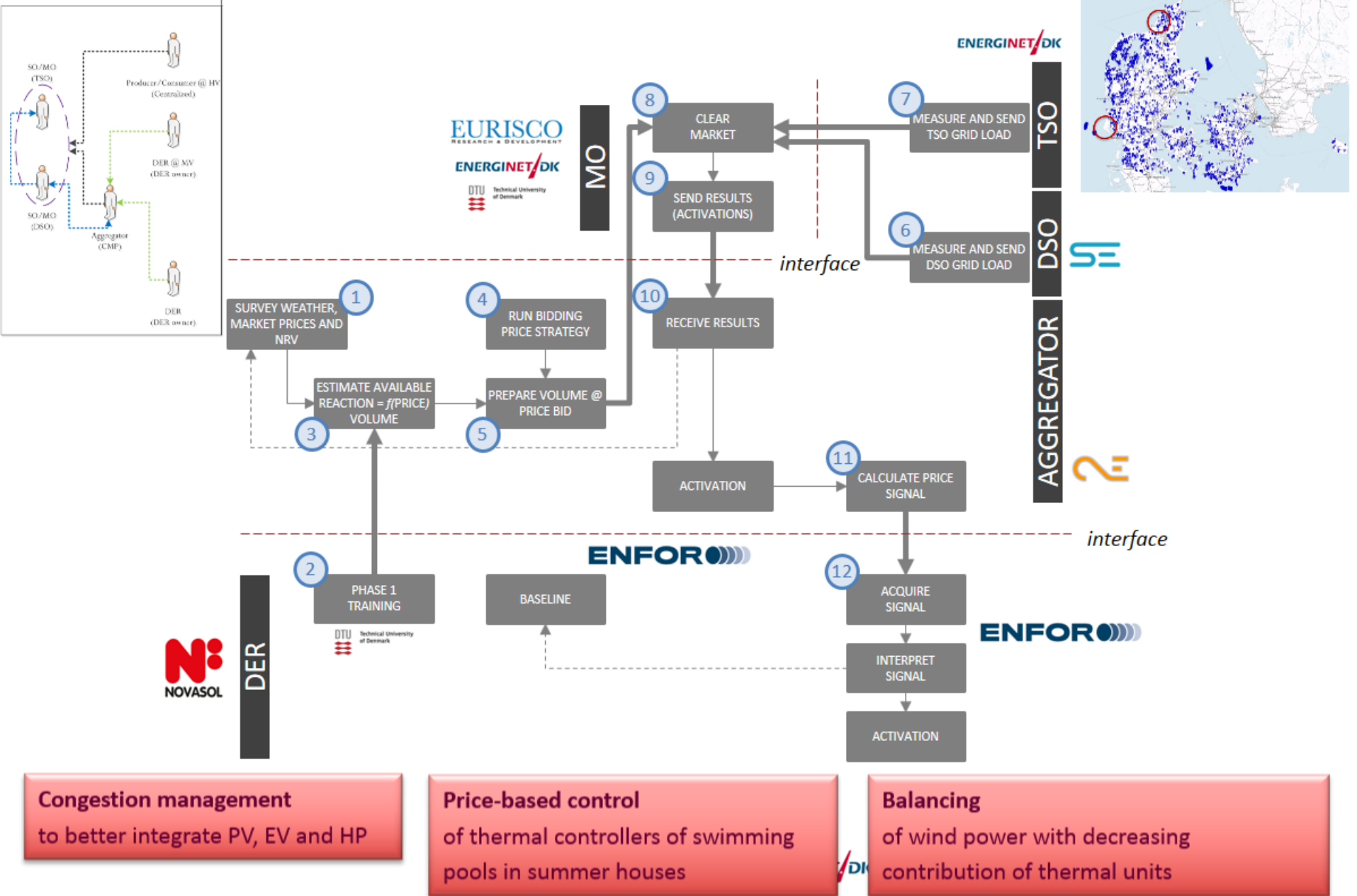
**Voltage regulation**  
by generators connected at HV and  
MV levels

**Power-frequency regulation / balancing**  
by generators connected at HV and MV  
levels

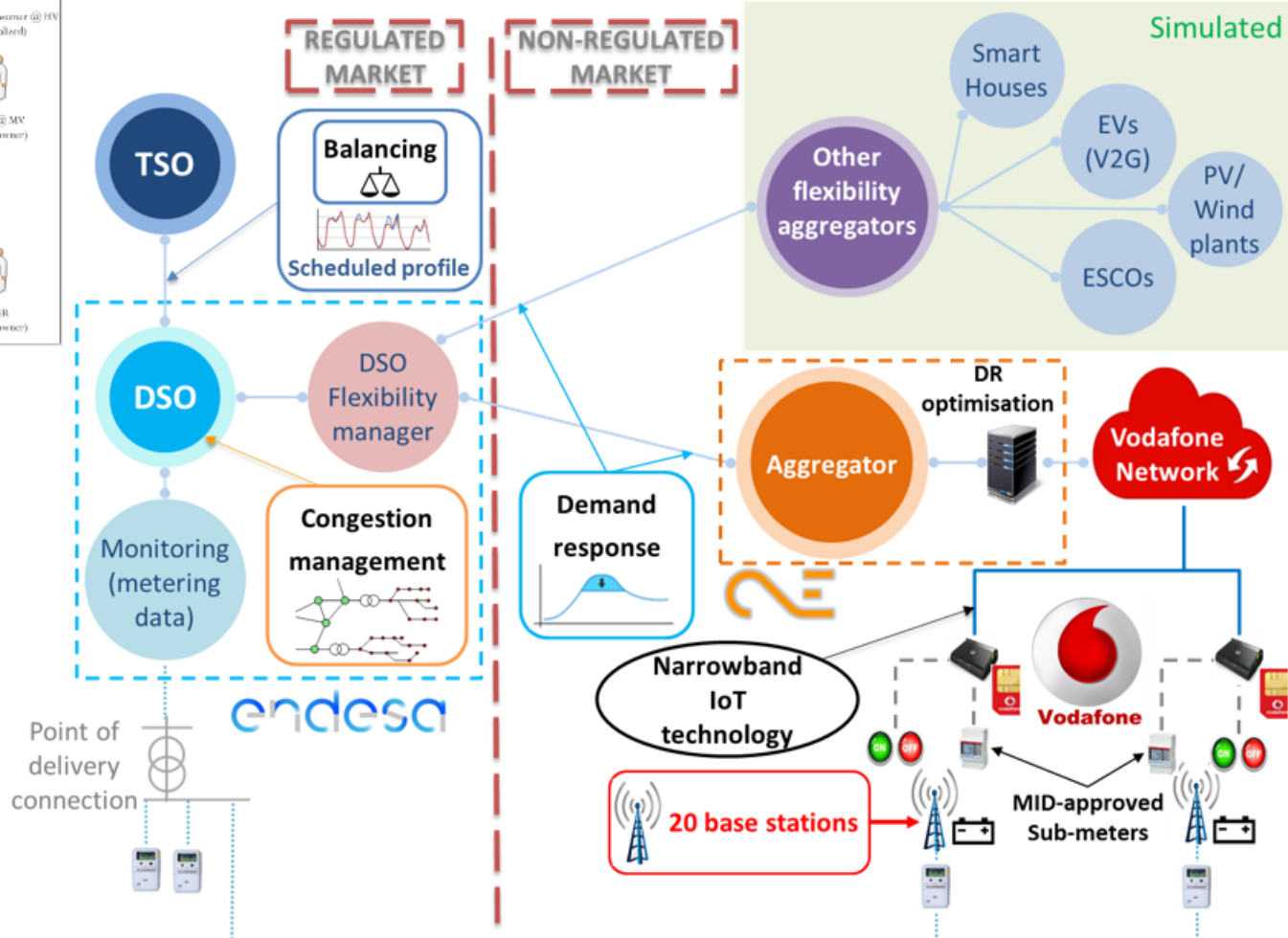
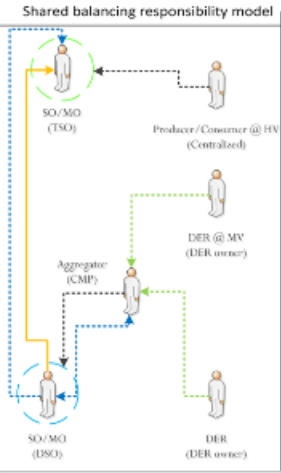
# Pilot B: Back-up slide



Common TSO-DSO AS market model



# Pilot C: Back-up slide



Congestion management  
at DSO level

Demand Response Aggregation  
by using storage flexibility (BS)

Power-frequency regulation / balancing  
by maintaining the exchange program at  
the TSO-DSO interconnection