

Research in electrical engineering and  
grid integration of renewables



Oriol Gomis-Bellmunt  
CITCEA-UPC & eRoots Analytics  
[oriol.gomis@upc.edu](mailto:oriol.gomis@upc.edu) [ogomis@eroots.tech](mailto:ogomis@eroots.tech)



Founded in 2001

Part of the TECNIO network

>70 members: 11 academics,  
50 engineers and researchers, 15 Master  
and Bachelor students, 3 administrative  
staff.

>100 customers >200 projects

>10 patents >500 conference papers

>300 journal papers

2 spin-off companies (TeknoCEA, eRoots)



Founded in 2022

Participated by UPC

Focused on software implementation for  
analysis of modern power systems

Consultancy and grid studies

Committed to open source code development

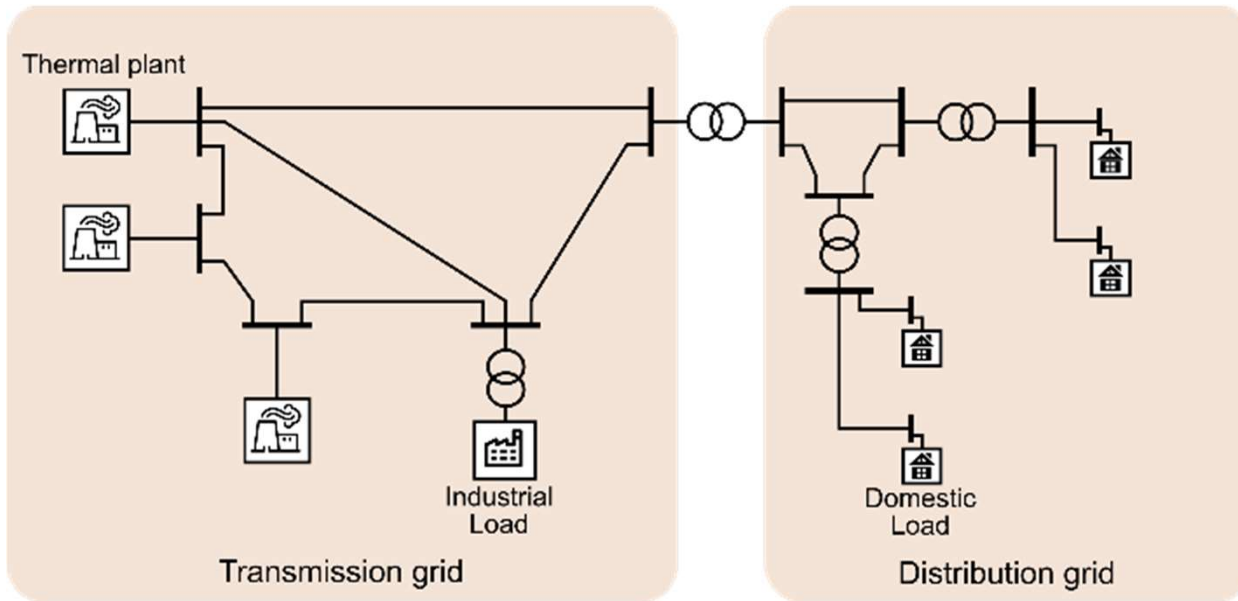
Orientation to implement and approach to  
market the research from CITCEA-UPC

Team >10 engineers and developers

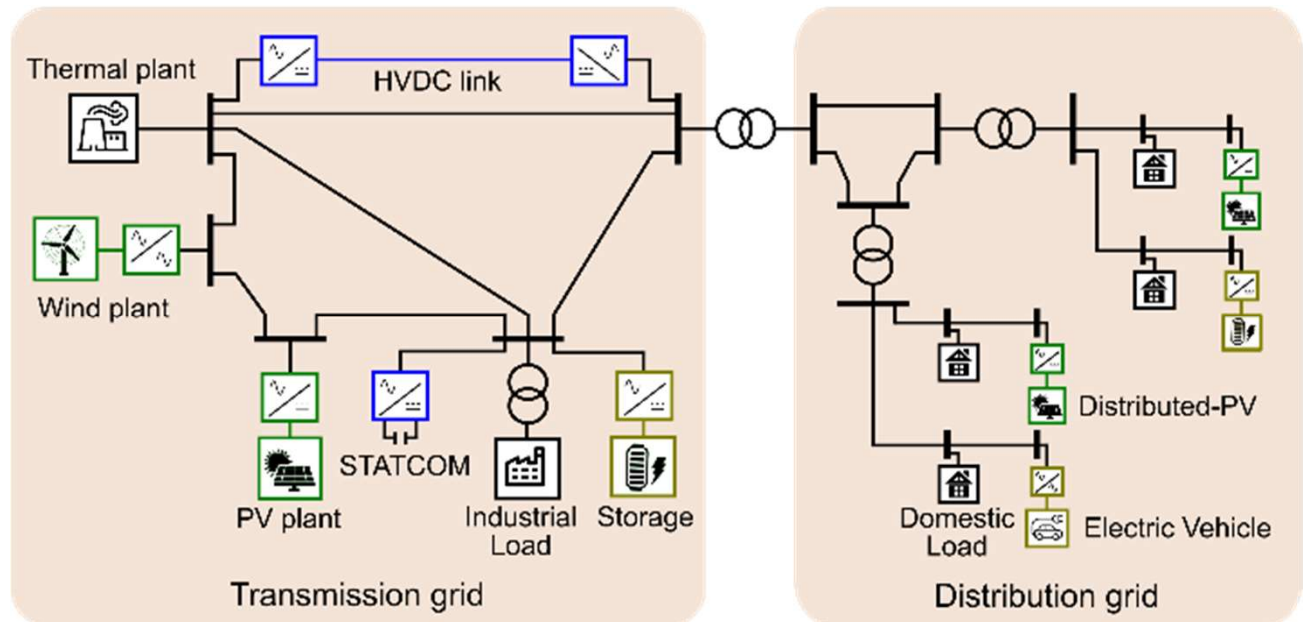


# The network transition

## Conventional grid



## Modern grid



## Increasingly present in...

- Renewables (Wind, PV, Ocean, some hydro, ... )
- FACTS / Energy storage / HVDC
- Electric vehicle / Industrial loads

## Main features

- Full controllability / Fast dynamics possible
- Very limited overload capability
- Very limited inertia



## Challenges due to the nature of power electronics

- Control interactions & stability? Inertia? Grid forming / following converters? Converter synchronization?
- Protections?
- Level of possible integration?

- Key players: Operators / developers / manufacturers / researchers
- Modeling in electrical systems can be really accurate (compared to other fields)
- EMT / RMS simulation studies
- Control information – very sensitive
- Blackbox models from manufacturers / Sensible data from operators
- Benchmark models from IEEE / Cigré
- Open source initiatives
- Open data repositories