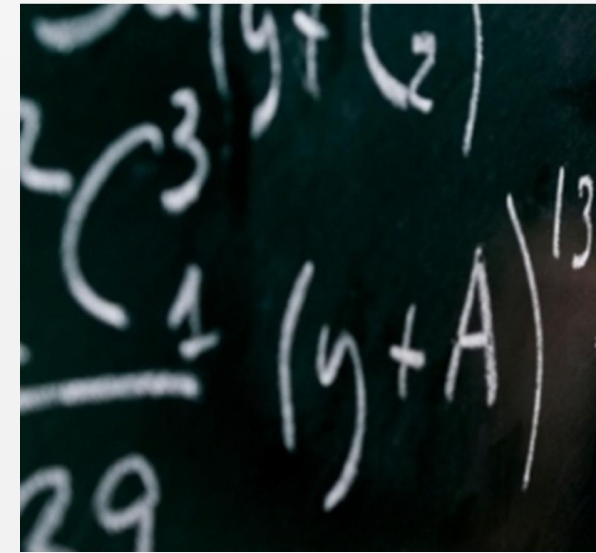
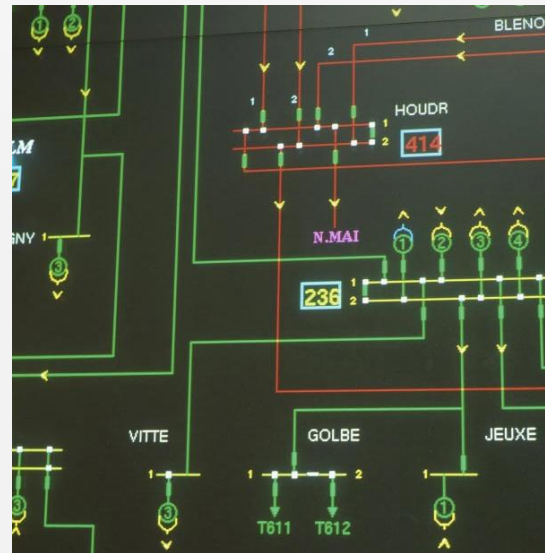


# Power Systems as « Cyber-Physical Systems of Systems »

## Workshop on Medium-Term Research Priorities for Cyber-physical Systems of Systems



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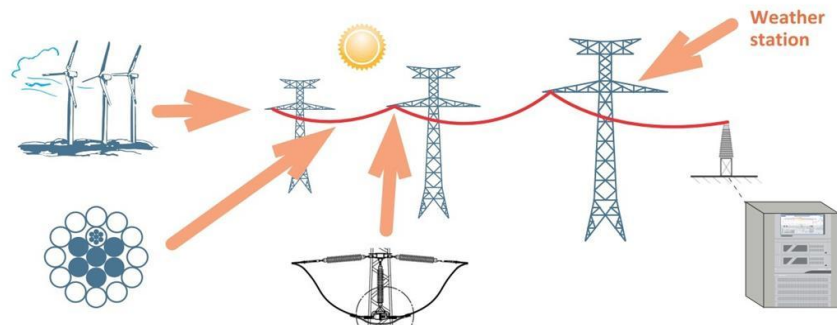
October 6<sup>th</sup> 2015

## ICT at the core of critical processes ....

- ✓ Energy Transition pushes towards more dispersed generation and distributed controls
  - To ensure a secure and efficient operation of large power systems → observability/controlability of large population of devices/agents
  - New ICTs offer opportunities but the security of electrical supply will depend more on wide area measurement/control/protection systems and the reliability of associated Information Systems and telecommunications
- Yesterday: ICT was mainly used for Optimization
- Tomorrow: ICT will be a critical layer to ensure a Stable Operation

# Cyber-Physical Systems of Systems

- ✓ We must integrate the «Cyber» dimension in all the decision making processes from system design to system operation.
  - Yesterday: «hardware» design then development of « software»
  - ➔ Co-design of «hardware/software»
  - e.g: «Dynamic Line Rating»: Capacity vs. Flexibiity

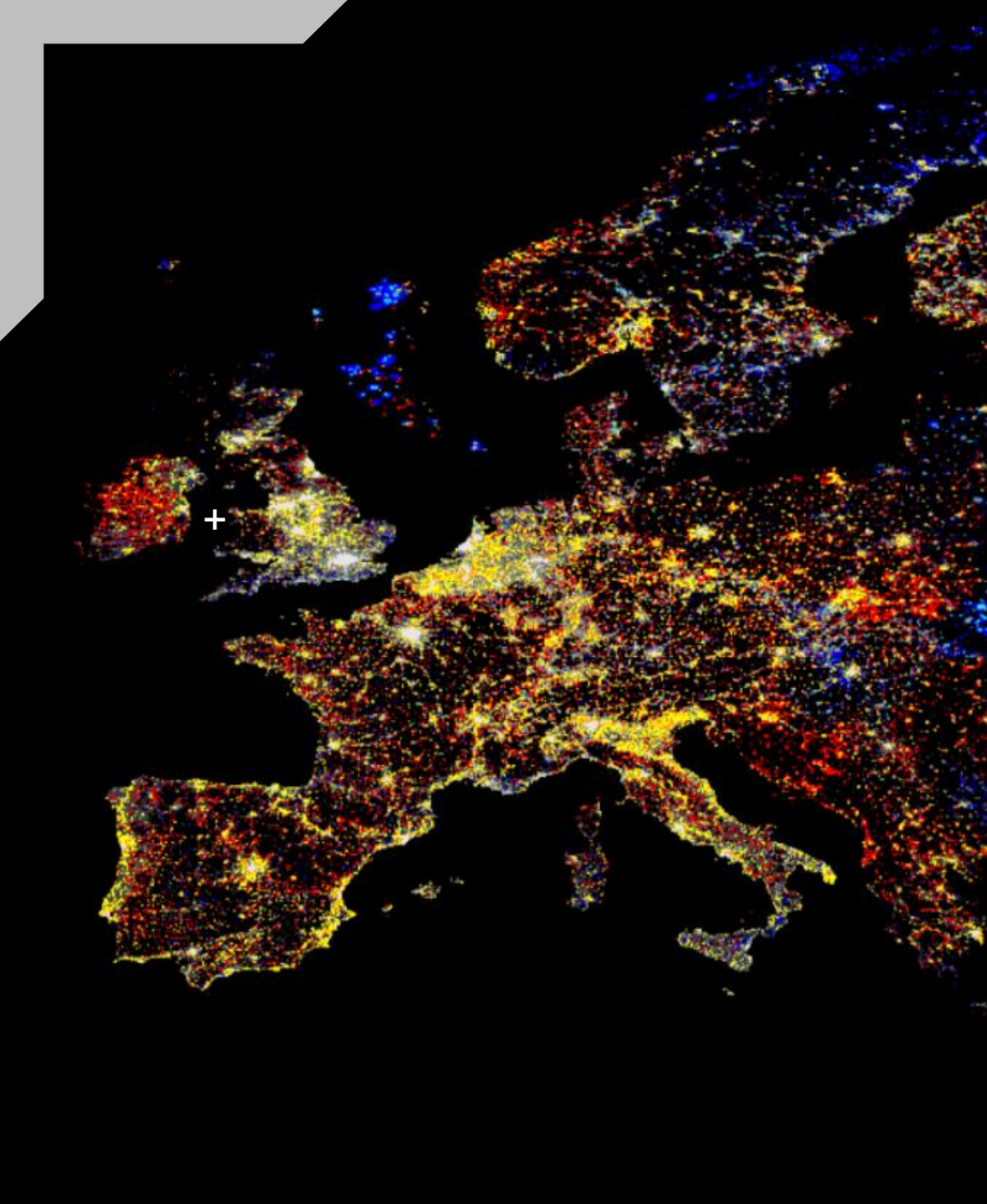


- ✓ Avenue for new projects: advanced ICT for complex, critical infrastructures ➔ CPSoS

## Possible associated R&D topics

- ✓ Control of inverter-based generating units
  - From «inertia» to «synchrony»
    - Synchronization based on wide area controls ...
- ✓ Control of large populations of devices/agents
  - Formal abstraction, aggregation, reduction
  - Mean field game
- ✓ BigData for «Power Systems»
- ✓ Internet of Things Technology for «Power Systems»
- ✓ High Performance Computing for «Power Systems»





THANK YOU  
FOR YOUR  
ATTENTION

