Power Systems as « Cyber-Physical Systems of Systems »
Workshop on Medium-Term Research Priorities for Cyber-physical Systems of Systems

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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
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. Flexibility

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