

Interdisciplinarity in modeling and simulation of energy efficiency scenarios



Some elements from a real use case

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Take home messages

- Modeling and simulation for energy efficiency
Example of simple load-shedding scenario
- Need for different domains to be put in interaction
 - Integrative view and design process
 - Collaboration of experts
 - Integration of existing tools, industrial standards



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Context: the MS4SG project

The MS4SG project

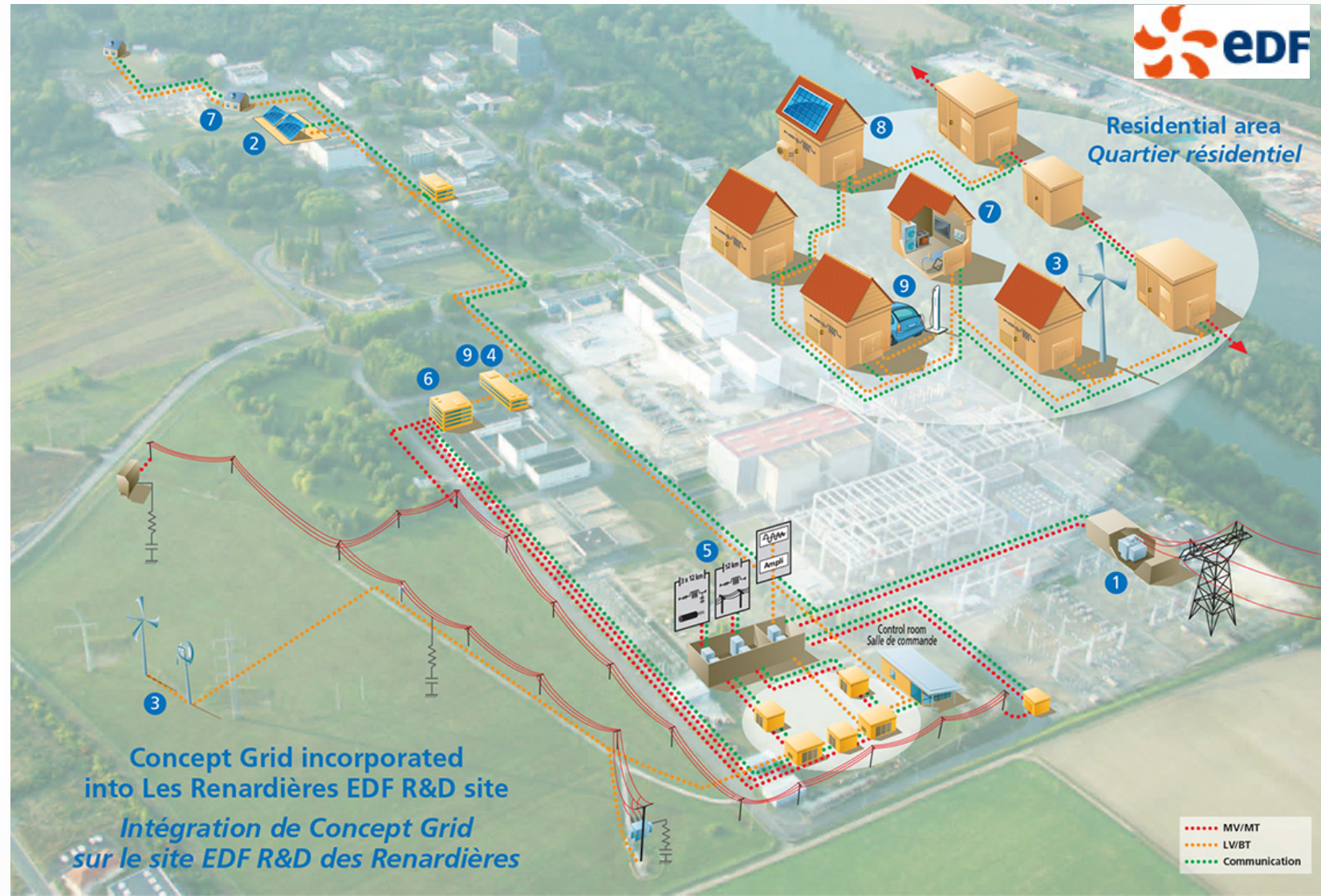
- MS4SG : Multi-Simulation For Smart Grid
 - Research project (2013-2016) between
 - LORIA-INRIA (Computer Science lab. in UL)
 - EDF R&D (major French electricity utility)
- Aim: *development of simulation tools for assessment of smart-grid management scenarios*
 - Scientific challenge: multi-simulation
(related to *model collaboration* – Action agenda p 13)
- This presentation:
 - Exemplify interdisciplinarity with a load-shedding use case



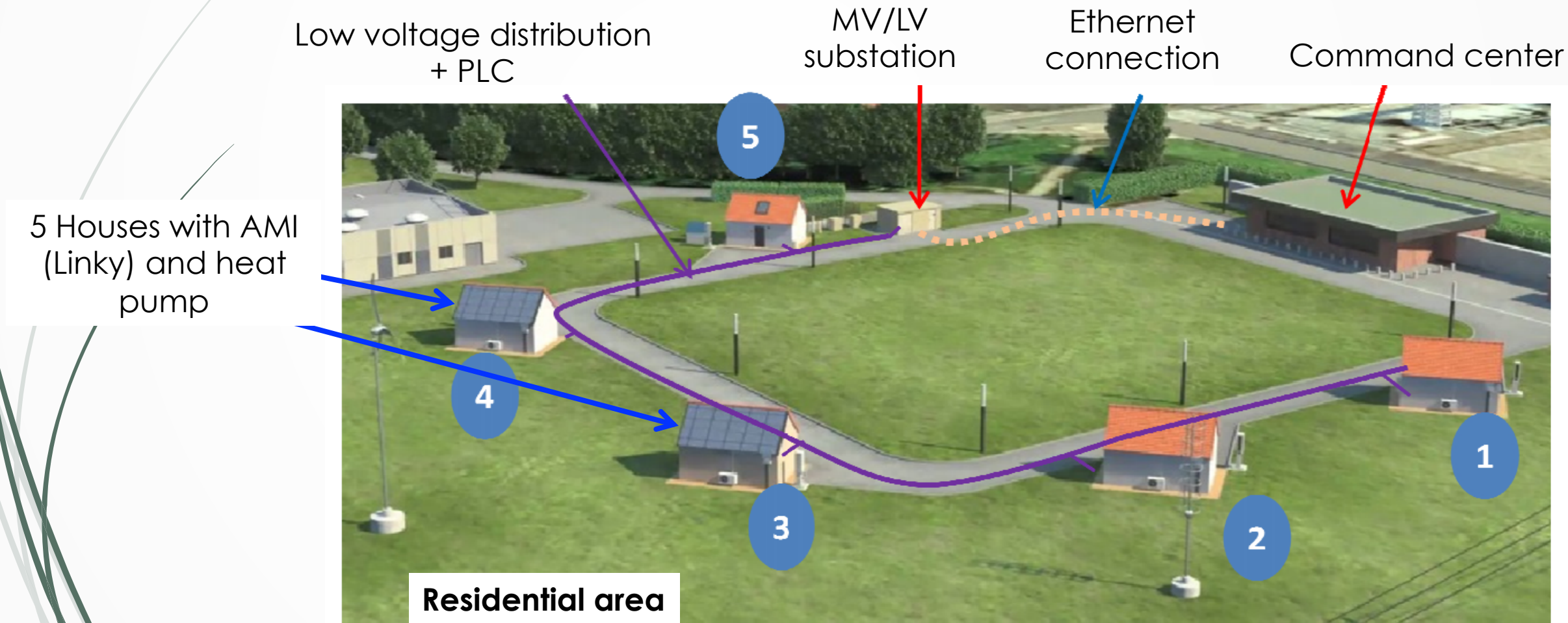
Concept grid

- full-scale smart grid test facility

Test scenarios before deployment at real scale
(eg, limit peak consumption)

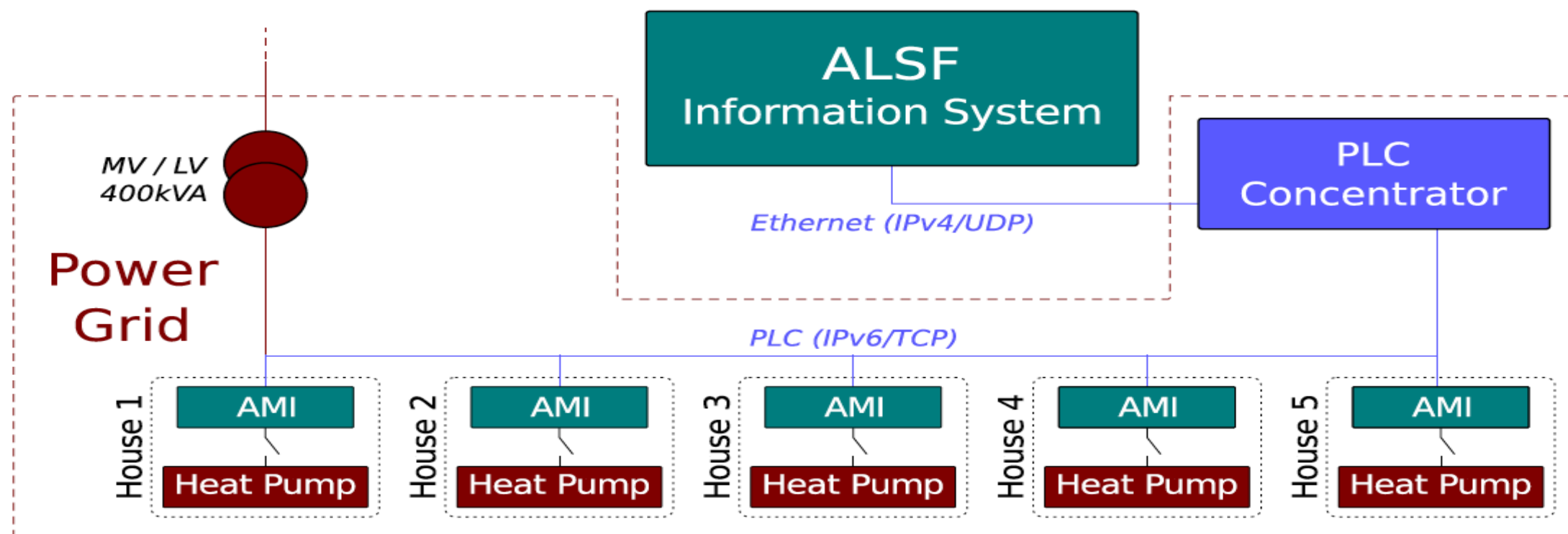


Focus: Load shedding (simple) scenario



Interdisciplinarity in the modeling and simulation of scenario

3 domains to model and simulate



Power
Grid

Communication
Network

Information
System

What means interdisciplinarity ?

- Different components, subcomponents
 - Sometimes shared between domains (eg, AML)
 - Several experts for the elements
- Different experts/skills:
 - No one is omniscient, collaboration of different actors required
- Different vocabularies (ontologies):
 - Sharing a minimal knowledge to communicate
 - Solving ambiguities (eg: network used both for electrical and telecommunication sides)

What means interdisciplinarity ?

- Different « views »
 - Integrating continuous/discrete representations into hybrid simulations
- Different modeling tools and industrial standards/norms
 - Reuse concern
- With mutual influences
 - Difficult/impossible to draw conclusions from isolated studies
 - Integrative view

Widen the example

- Include people
 - Different households,
 - Activities representations (individual based modeling)
 - Pricing policies and household decisions
- In an environment
 - Different scales: building, quarter, city,
 - Different areas: Residential, commercial, agricultural, industrial, ..
- More (non technological) domains in interaction
(social sciences, geography, economy, ...)

Conclusion

- Modeling and simulation for energy efficiency
Example of simple load-shedding scenario
- Need for different domains to be put in interaction
 - Integrative view and design process
 - Collaboration of experts
 - Integration of existing tools, industrial standards

To learn more on the MS4SG use cases

- Multi-agent Multi-Model Simulation of Smart Grids in the MS4SG Project Vaubourg, J., Presse, Y., Camus, B., Bourjot, C., Ciarletta, L., Chevrier, V., Tavella, J.-P., and Morais, H. (2015).
In Demazeau, Y., Decker, K. S., Pérez, J. B., and Prieta, F. d. I., editors, *Advances in Practical Applications of Agents, Multi-Agent Systems, and Sustainability: The PAAMS Collection*, number 9086 in Lecture Notes in Computer Science, pages 240–251. Springer International Publishing.