

Modeling and simulation issues at EDF enabling energy challenges

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ABSTRACT

An industrial utility like EDF needs to better understand the behavior of energy infrastructures like power plants (nuclear, thermal, renewable,...), electrical networks, but also energy management. The objective is to increase safety, performance, lifetime, and optimize processes. To reach these goals, it is necessary to better understand various phenomena met inside the infrastructures, for example: nuclear components (containment building, PWR vessel, steam generator, fuel rods), networks (electrical grids) or energy management (quality of electricity), in order to win margins. This is done using various numerical softwares developed at EDF R&D. The use of HPC and intensive simulation allows new approaches and new perspectives.

On the other hand, due to the significant increase of data produced by our production systems, our electrical infrastructures and our commercial activities, and the progress of IT solutions, more and more problems can be handled by disruptive approaches, such as Data Science, Data Analytics, Artificial Intelligence, Virtual and Augmented reality... Here again, the use of the new computing powers allows new possibilities previously underutilized, complementary to physical modeling approaches.

Some applications will be shown for various domains.

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Ange Caruso obtained his PhD in 1988, in the field of Energy Transfer and Combustion. From 1989 to 1998, he has worked in the field of CFD, developing softwares using finite elements and finite volumes methods. In 1999, he was project manager in order to numerically simulate the behavior of PWR vessels in EDF nuclear power plants, using CFD, thermal, structural mechanics and neutronics softwares. From 2001 to 2008, he was responsible for various study groups treating about subjects like nuclear accidents, thermal-hydraulics and chemical effects, mechanical behavior on nuclear components, fuel storage, and codes development. In 2008, he was Deputy Manager of Fluids Mechanics, Energy and Environment Department.

Since 2012, Ange Caruso is the Information Technologies Program Manager at EDF R&D, driving projects on Advanced Simulation, Information and Communication Technologies, and Complex Systems Modeling.