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Introduction

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Introduction

Throughout the history of humanity many scientists and philosophers have called mathematics the natural language of physics. If it is true that mathematics can exist independently, of all times, the sciences of explanation of reality have advanced in parallel with the progress of mathematical science: optics developed thanks to geometry, classical Newtonian mechanics relied on differential and integral calculus and Maxwell's electromagnetism required partial differential equations. In some cases, the resolution of a physical problem has played a key role in the development of mathematics and in other situations, it is mathematics that has made it possible to predict physical phenomena not yet observed.

Today mathematics still has a strong impact on physics and on many industrial applications. At EDF, mathematics plays a key role in many areas, including modeling complex systems and solving optimization problems. The very current challenges of the fight against climate change and its impacts as well as the consequences of health and geopolitical crises increase complexity. The models and algorithms developed by our researchers must be at the forefront to enable very concrete operational decisions to be made, such as the management of energy storage facilities, the programming of maintenance operations on production assets or the anticipation of the impacts of climatic hazards on distribution networks.

We have thus set up joint research laboratories with academic partners of excellence, such as PGMO and FIME, which we have just renewed in 2021 and we have many theses in progress that cover themes common to mathematics and energy. The results of this work are then integrated into models and tools made available to the EDF Group's businesses.

At EDF's R&D our feedback shows us that the link between academic and industrial researchers in the field of mathematics allows for great achievements.

This is why I am delighted to write the editorial of this special issue of Maths in Actions which shows, if it is still necessary, that mathematics can solve contemporary industrial problems in many fields.

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