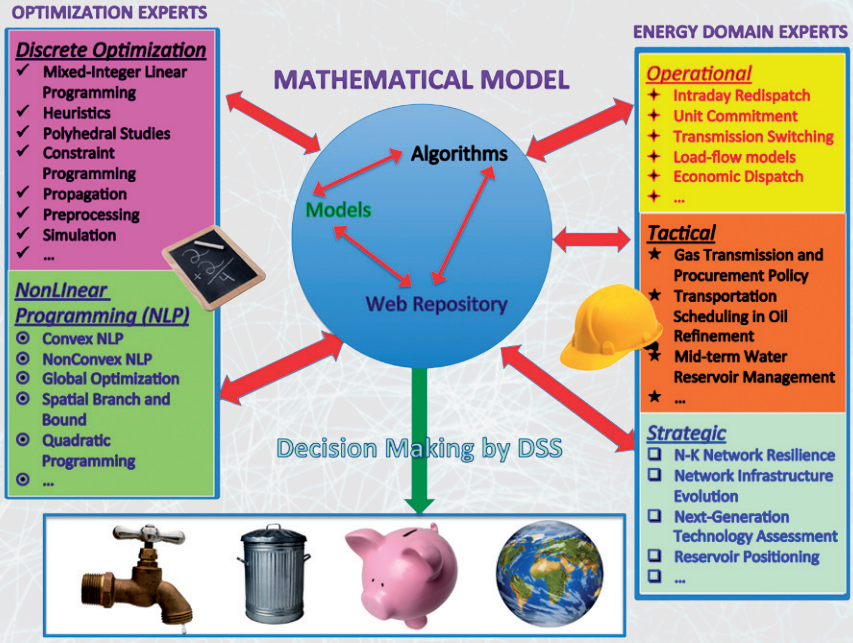
Models to meet modern energy challenges

Mathematical optimisation has long been central to decision making in the energy sector, but research has not always been coordinated effectively. A new COST Action aims to address this issue by bringing together researchers from different disciplines to exchange results and share information, as **Professor Andrea Lodi** explains

The increasing size and complexity of Energy Production and Distribution (EP&D) networks is heightening the need for sophisticated systems which support operational, regulatory and design decisions. This has long been a focus of research, yet much of it was historically done independently by different research communities; Professor Andrea Lodi is the coordinator of a COST action which aims to coordinate interdisciplinary research. "The focus of the project is on providing appropriate means to the different research communities interested in Decision Support Systems (DSS) and EP&D to effectively exchange results," he outlines.

Collecting the right data, both historical and current, is a key step towards the optimisation of EP&D networks. Data from sources like sensors and mobile tools helps researchers define the real problems that need to be solved and ensure their work is targeted at practical needs. "In addition, data must be made available to the scientific community, so as to boost research and development," says Professor Lodi. "The tight interaction with industrial partners and Domain Experts allows the Action to take energy consumption into account as a key factor for decision making."



Decision Support Systems

This research encompasses virtually all aspects of EP&D, bringing together communities of experts in mathematics, computer science and engineering. Professor Lodi and his colleagues across these disciplines are exchanging results in a highly novel way. "We aim to exploit the often-overlooked fact that the construction of the mathematical models underlying a DSS entails the need to 'distill' information about the actual application, thus overcoming the (sometimes conflicting) views of the many different experts that study the different aspects of a complex problem," he explains.

The action is also considering renewable sources of energy, which bring enormous opportunities in terms of effective utilization and design. However, coordinating these different energy sources introduces even more challenges from an optimization perspective. "Environmental issues are hotly debated nowadays, and are central to the Action. Renewable sources are fundamental for the sustainability of EP&D, but their integration in the current production mix is extremely challenging due to several factors, among which is their uncertainty. This requires novel approaches involving many different skills that need to be developed and honed," says Professor Lodi.

There is no specific mathematical technique that in isolation can tackle the current challenges facing the energy sector, underlining the importance of continued research and collaboration in this area. The Action is committed to sharing its findings and this will form a key part of the future agenda. "The goal is to build a Wiki Page for EP&D containing all the material collected and developed during the Action in terms of data, models, algorithms, software implementations and publications, which should be able to survive the end of the Action and assume a central role in further developments of the wider area," continues Professor Lodi.

Mathematical Optimization in the Decision Support Systems for Efficient and Robust Energy Networks (COST Action TD1207)

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Professor Lodi believes data must be made available to the scientific community, while close interaction will allow the Action to take energy consumption into account as a key factor in decision making.

m² c = +e

mathematics × models × computations = more energy

A COST PROJECT