

StoOPT.NRW Research Project

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Partners:

1. University of Duisburg-Essen (Essen), Coordinator
2. ProCom GmbH (Aachen)

Title:

IT tools and systems for the sustainable management of cogeneration and storage systems

Application of stochastic optimization to the scheduling of multi-asset systems with CHP and renewable generation components

Project objectives:

The restructuring of the energy system—in particular with the integration of the fluctuating supply from renewable energies—requires additional flexibility in the plant inventory. This presents enormous technical and economic challenges for the operators of conventional and renewable generating portfolios. Consequently, innovative approaches and IT tools to support plant operators are required to stabilize the overall system and to ensure sustainable competitiveness, so that existing flexibilities can be marketed in the best possible way taking into account the relevant uncertainties, such as the supply of energy from renewable sources.

The business location in North Rhine-Westphalia is characterized by a high population density and a high demand for energy. The use of combined heat-and-power (CHP) generating sources is long established. These systems make it possible to use fuels in a highly efficient manner, but they are also subject to specific operational restrictions, because they not only produce electricity for the national market, they also have to cover the demand for heat in their localities. Even so, they have a significant potential for flexibility that at the present time is insufficiently exploited, however. The additional installation of heat or battery storage and the use of power-to-heat and power-to-gas technologies allows a high degree of exploitation, however.

The project therefore involves the development of innovative methods for identifying the aforementioned flexibility and allowing it to be exploited by the use of stochastic optimization.

By building prototype IT tools on this basis and testing them in realistic application scenarios, a significant contribution will be made to maintaining and improving the economic performance of CHP plants in North Rhine Westphalia and beyond, which will provide an important prerequisite for the efficient use of resources and for climate protection.

Objectives of ProCom GmbH

The objectives of ProCom GmbH consist not only of providing a stochastic model for uncertainty factors, such as electricity and heat demands and spot market prices for electricity, as well as analyzing and developing new stochastic optimization methods, but also of producing new IT tools. The purpose of these is to optimize the operation of CHP and other composite systems under uncertain conditions, and they are to be made operationally available for the optimal exploitation of flexibility. The main objectives of ProCom are to design and provide a practical IT environment as required for this. The aim is to be able to produce effective recommendations for dealing with short-term plant operation and making the corresponding marketing decisions in their daily business.

A further aim is to provide methods whereby combined heat-and-power (CHP) systems including heat storage and power-to-heat plants can be optimized under uncertain conditions. These methods should also be extended to the increasingly installed combined portfolios of conventional and renewable plants as well as power-to-gas plants. Particular attention is also paid to the preparation of the input data and the results of the optimization, as well as the integration of the methods into the processes and procedures of CHP and other plant operators.