Combining LP and MIP approaches to model the impacts of renewable energy generation on individual thermal power plant operation.

Abstract:
A common method of modeling the operation of power plants in competitive electricity markets is mixed integer programming (MIP). Despite the advantages of the method, it requires solving an NP-hard problem. Modeling all of Europe with several thousand power plants thus would take enormous computational power. In order to reduce problem complexity in this large scale system, while still including detailed behavior of individual plants, we develop an approach where MIP is applied only to focus regions that are analyzed in detail combined with a linear programming model (LP) of all other regions. This combination allows for the prediction of impacts of renewable integration all over Europe on individual power plants in Germany. The results indicate that operational hours of thermal power plants will go down significantly, while the number of start-ups will increase. In order to avoid curtailments of renewable power,