

## Thesis/Hiwi Project on Smart Grid Operation

You would like to improve your competence in smart grid operation and help to solve some of the biggest challenges in this area? Then this project could be interesting for you!

With the increasing amount of renewable energy sources in electricity grids, the volatility and uncertainty increases. On the other hand, new components such as storages and small combined heat and power plants (CHPs) offer possibilities to cope with these challenges. Storages and CHPs are, however, often located in medium and low-voltage grids, which are currently typically neither monitored nor actively controlled. Moreover, the control authority is distributed among many system operators, which makes coordination a challenge.

In current research projects, we investigate optimization-based approaches for utilizing flexibilities from new system components in medium and low-voltage grids [2]. We develop new optimization-based approaches ranging from classical optimal power flow problems via centralized solvers, to distributed and robust optimization techniques [1]. Possible tasks for you include

- a literature review on current practices of system operator coordination;
- developing optimization-based approaches for system operator coordination;
- mathematical formulation and implementation of solution approaches;
- ... your own ideas?

Please send your application to [alexander.engelmann@tu-dortmund.de](mailto:alexander.engelmann@tu-dortmund.de)! It would be great if you would attach a list of covered lectures including grades and a short motivation letter to your email.



Note that for this project it is mandatory to have a strong interest in mathematical concepts and numerical optimization.

**Preferable background:** engineering, applied math, control, data science  
**Required skills:** basics of numerical optimization, linear algebra  
coding skills in MATLAB, Python or Julia

## References

- [1] A. Engelmann, Y. Jiang, T. Mühlpfordt, B. Houska, and T. Faulwasser. "Toward Distributed OPF Using ALADIN". In: *IEEE Transactions on Power Systems* 34.1 (2019), pp. 584–594. ISSN: 1558-0679.
- [2] Redispatch Consortium. *The research project "Redispatch 3.0"*. <https://www.offis.de/offis/projekt/rd30.html>. 2022.