
Innovation type: Computer model

TRL: 3-5

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Target group:

| Actor/ purpose | x |
|---|---|
| DSO, TSO | x |
| Technology provider | x |
| Member organisation | |
| Market operator | x |
| Research/ Consultancy | x |
| Teaching | x |

| Solver | Computational time (sec) |
|---|---|
| FMINCON | 0.411 |
| CONOPT | 0.408 |
| CONOPT4 | 0.592 |
| COUENNE | 0.637 |
| IPOPT | 0.538 |
| IPOPTH | 0.517 |
| KNITRO | 0.461 |
| MINOS | 0.413 |
| PATHNLP | 0.472 |
| SNOPT | 0.385 |
| The Proposed Method | 0.056 |

*Comparing the computational time with benchmark solvers for a small 3-bus system.*

# BATTPOWER Toolbox: Memory Efficient and High-Performance Multi-Period AC Optimal Power Flow Solver”

*AC Optimal Power Flow (AC OPF) is a useful tool for modern grid planning, as wind, PV, energy storage and flexible demand become common parts of the system. We have developed a model which is able to solve the Multi-Period AC OPF problem in a fast way, making it highly attractive for simulation of large and complex grids*

## Challenge

Energy storage and flexible demand makes AC OPF computational very challenging to solve, and computation time is an issue when using commercial or free optimization solvers.

## Solution

The solution is to derive a tailor-made optimization solver for the problem, utilizing the structure of the underlying mathematical formulation of the system. The method has been successfully tested on different test grids with different sizes and complexity.

## Potential

Relevant for DSOs facing new challenges in planning and operation of their grid, such as:

1. Increasing amounts of prosumers with PV and batteries. The grid operators must be able to predict their net load profile, and also give right price or control signals for activating use of flexibility for grid services.
2. Increasing amounts of medium-scaled distributed generation, such as smaller wind farms and solar PV farms. These can be located in areas where the grid is weak. Energy storage can be an alternative to grid reinforcements.

## Reference in CINELDI

The model is developend by in-kind PhD candidate Salman Zaferanlouei at NTNU, under guidance by Magnus Korpås (NTNU) and Hossein Farahmand (NTNU). The PhD is funded by NTNU through the OADE project.

S. Zaferanlouei et al. “Computational Efficiency Assessment of Multi-Period AC Optimal Power Flow including Energy Storage Systems”, IEEE SEST 2018.