

# Smart Energy Systems

Winter 2020-2021

Optimization Project Group

## Milestone 3

The objective of this milestone is to investigate the influence of the number of Monte Carlo samples, equip your optimization framework with minimum uptime, downtime, and ramping constraints, and study the influence of an energy storage resource (*ESR*).

### Task Descriptions:

1. Investigate the influence of the number of Monte Carlo samples by varying the number of samples from  $10^2$  to  $10^6$  on a base-10 log scale and fix the first-stage decisions obtained under each number of samples. Subsequently, generate 1000 new samples and compute the mean and the variance of the optimal cost with the fixed first-stage decisions associated with each number of samples.
2. For the thermal generation resource (*TGR*), add a minimum uptime constraint of 3 hours, minimum downtime constraint of 4 hours, and a ramping constraint of 5 *kW*. Mathematically express these constraints. Repeat Task 1 and report the influence of the added *TGR* constraints on the computational time.
3. Integrate an *ESR* with a maximum charging and discharging power 10 *kW* and an energy storage capability of 5 *kWh*. Mathematically express the constraints. Repeat Task 1 and report the influence of the added *ESR* constraints on the computational time.
4. Study the sensitivity of the energy storage capability by varying it from 0 *kWh* to 20 *kWh* in 4 *kWh* increments. Repeat Task 1.

### Expected Outcome:

You are asked to

1. send me your source code by no later than 10 a.m. on January 19, 2021 at yurdakul@tu-berlin.de.

2. prepare a slide set depicting the work you carried out as well as the results you obtained. The prepared slide set is to be presented in class on January 19, 2021; the duration of the presentation is 15 minutes.