TITLE: *HTD Canvas for SES-MGES Project*

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DATE: *11/11/2021*

Object under Investigation *(OuI)*:

1) The power exchange between SEH with power system.
2) The Heat exchange between SEH with District Heating Network.
3) The gas purchased from gas network.
4) The energy trades between energy conversion systems.
5) The energy exchange for storage system.

Function(s) under Investigation *(FuI)*:

1) The power exchange between SEH with power system.
2) The Heat exchange between SEH with District Heating Network.
3) The gas purchased from gas network.
4) The energy trades between energy conversion systems.
5) The energy exchange for storage systems.

Domain under Investigation *(DuI)*:

- Electrical
- Thermal
- Gas
- Environment

Target Metrics *(TM)*:

1) The balance of energy supply and demand.
2) Efficiency of system components.

Test Objectives:

In this test case, optimal day-ahead scheduling of the proposed Smart Energy Hub (SEH), containing HTHP storage system and local renewable energy system will be studied.
The proposed SEH will be considered as a prosumer and its participation on the day ahead energy market will be investigated. The study of this case is carried out as offline optimal operation for day ahead scheduling to find the best bidding strategy and charging and discharging modes.
Optimization problem is applied to reach the best plan for next day by considering a quarterly planning horizon for upcoming uncertainty parameters including wind, solar, energy price, and load.

Purpose of Investigation *(PoI)*:

1) The balance of energy supply and demand.
2) Maximizing SEH profit

Test Criteria *(TCR)*:

The system states in during simulation should cover all of the SuT limitations listed in QA section.

Quality Attributes *(QA)*:

The limitations considered for *SuTs*. They are as follows:
1) Generation limitation of CHP
2) Output limitation of Absorption chiller
3) Output limitation of Electrical boiler
4) Output limitation of Heat pump
5) Capacity/Charge and Discharge limitation of HTHP storage system
6) Capacity/Charge and Discharge limitation of Heat storage system

System under Test (*SuT*):

In this test case, the SEH will be considered as main system, which it is connected to upstream energy network and also local renewable energy resources as well as local demand. The Internal components of the proposed SEH are as follows:

- CHP plant
- Absorption chiller
- Electrical boiler
- Heat pump
- HTHP storage system
- Heat storage system

Functions under Test *(FuT)*:

- Physical response of internal systems
- Charging and discharging mode
- Bidding strategy

Variability Attributes *(VA)*:

- The amount of energy exchange between SEH and upstream energy networks
- The amount of energy exchange between energy conversion systems.
- The amount of energy exchange for storage system.