

Modelling district heating systems in Stanet: An investigation of the dynamic storage module with result validation

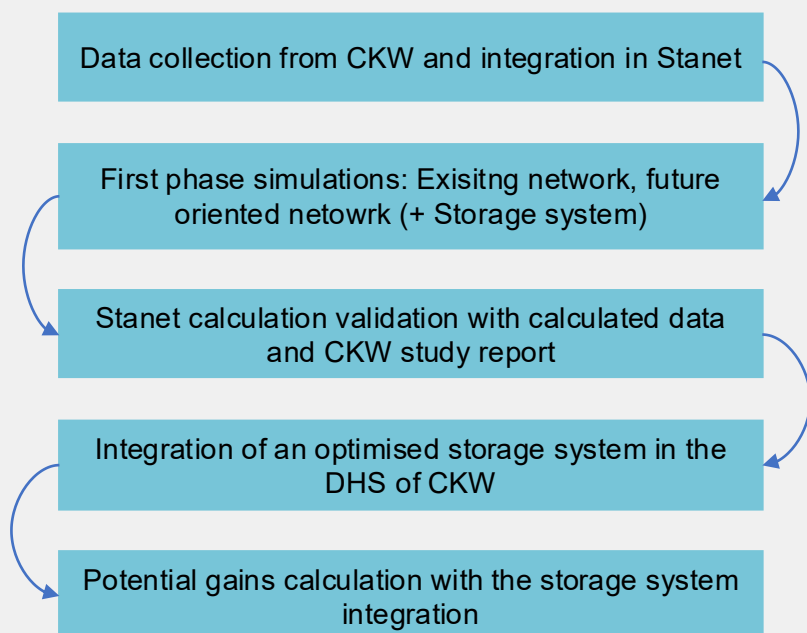
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1. Introduction, Goals and Research Questions

Amstein+Walthert AG (A+W) is working with several district heating operators in Switzerland by providing consultancy services for the district heating systems (DHS). A+W is modelling such DHS in a German based software, Stanet. This software allows them to run simulation with different configurations and understand the status of the DHSs. A+W is interested to examine a new module in Stanet that allows to simulate dynamic storage system operations in the modelled DHS. From this study, A+W would like to apprehend whether this dynamic storage module is beneficial and can help to provide further services to their DHS operator clients.

2. Method Overview and Materials

CKW AG volunteered with its DHS data for this project. The data includes the existing consumers in their networks and the potential consumers expected to join in the future. The following workflow explains the methodological structure of the thesis.



A consumer demand profile for a cold winter day is also generated in this study and distributed to attain 80% concurrency factor. The calculations made in this thesis have similar configurations as Stanet and the study report from CKW to make logical comparisons.

The theory of having the storage system is to increase the power output in order to supply more consumers in the future. Moreover, it is to unify the two heating networks, which are currently separated. The storage system installation in the Stanet model is done through a control script that dynamically commands the storage to charge / discharge based on the demand of the network. The approach for the storage installation aimed to utilise more heat pump energy and fewer wood boiler based energy. Through this method, the energy produced for the network would be more sustainable and cheaper.

3. Results and Discussion

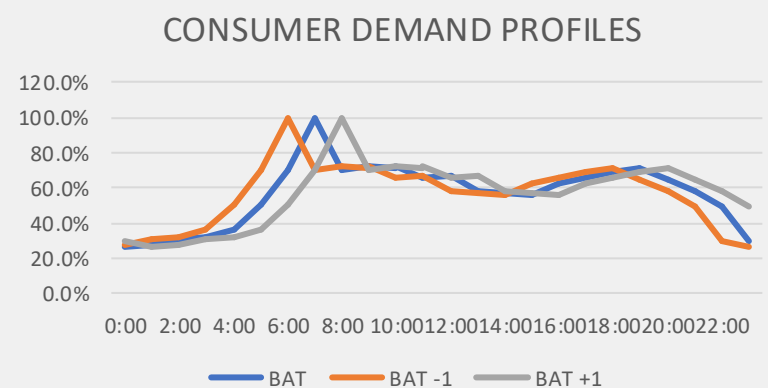


Figure: Consumer demand profiles

Combined storage system concept for Weggis DHS

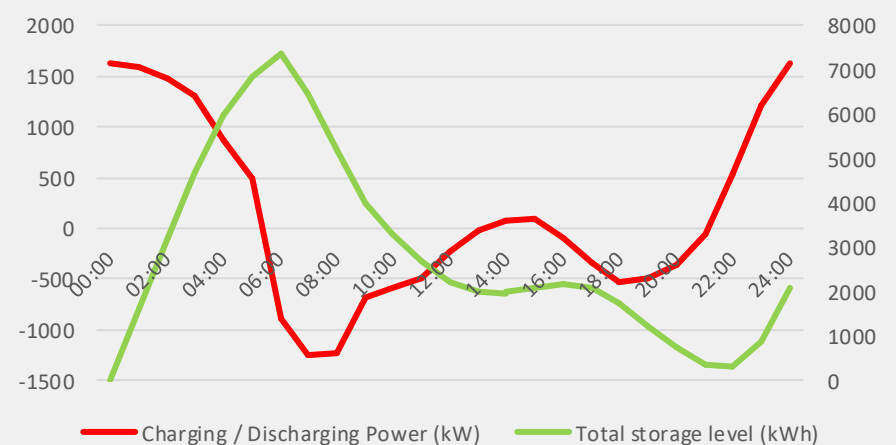


Figure: Simulated optimised storage system results

The integration of the storage system in the DHS allows up to 4790 kWh of energy to be shifted from the wood furnace boilers to the heat pumps, which reduces the cost of the energy produced for the network.

4. Conclusion and Recommendations

The findings from this thesis imply that the dynamic storage module of Stanet can be used by A+W to provide additional services to district heating system operators. This module can help to compute complex hydraulic calculations and provide estimated results for storage system. However, it is suggested that the validation of Stanet results to be done with actual measurements from the DHS.

References

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