# DECOUPLING OF ELECTRICITY AND HEAT PRODUCTION IN ENGINE DRIVEN CHP PLANT WITH ENERGY STORAGE SOLUTIONS

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## AIM

The aim of this task was to study possibilities for decoupling of electricity and heat production in an engine driven CHP plant by means of energy storage solutions.

## METHOD

A Simulink model was constructed to simulate the operation of a CHP plant which consisted of one Wärtsilä 20V34SG gas engine and energy storages. The simulations made were divided into electric and heat mode studies. In the electric mode simulations a lithium-ion battery for the smoothing of fluctuations in electricity demand was studied. The engine was run with a fixed power output throughout the simulation period. Four fixed outputs of 7.5, 8.0, 8.5 and 9.0 MW were selected for the engine and the battery capacity was scaled for every power output.

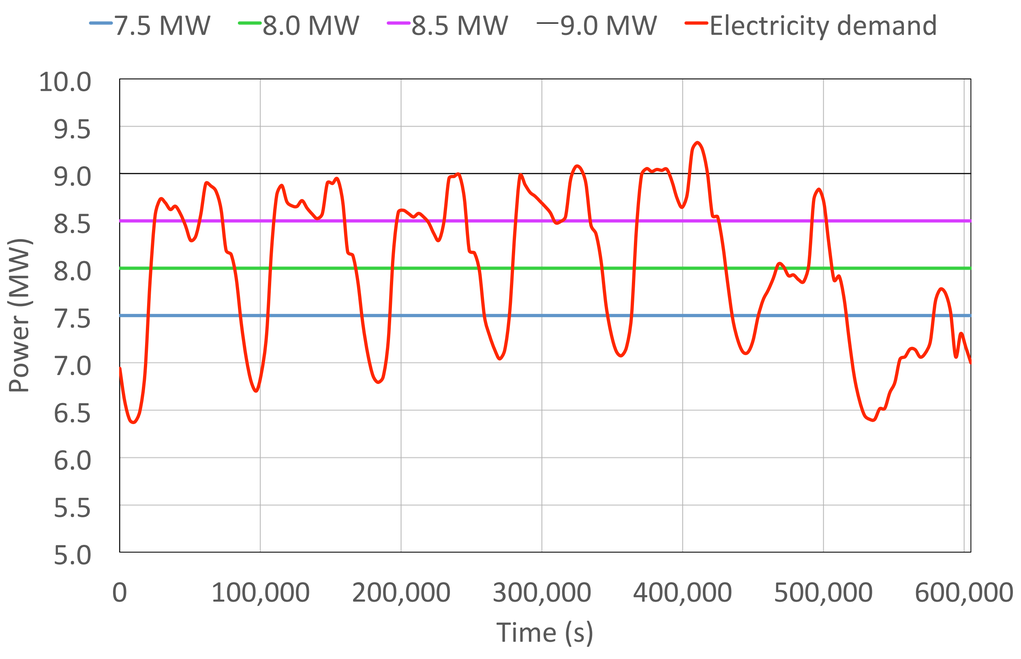


*Figure 1. Engine outputs and electricity demand.*

In the heat mode simulations the profitable heat accumulator volumes with different operation principles were analysed with three running costs (70, 80 and 90 €/MWh per electricity-MWh) and two heat demands (winter and summer).

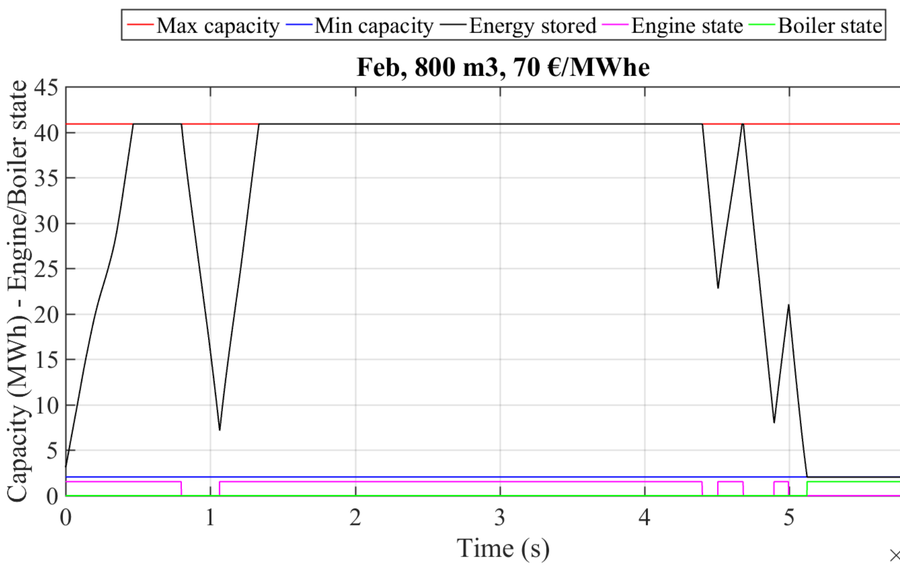


*Figure 2. Example graph of the heat mode simulations.*

## CONCLUSION

- In the electric mode, the power output of 8.5 MW offered the smallest battery capacity: A 30 400 kWh lithium-ion battery resulted in a price of 8.3 MEUR.
- In the heat mode, it was more economical to utilize smaller heat accumulator volumes in the winter than in the summer.
- The average electricity price and heat demand were lower in the summer than in the winter which affected on the optimal accumulator volumes.

**REFERENCE:** Kumlander, V (2016). Decoupling of electricity and heat production in engine driven CHP plant with energy storage solutions University of Vaasa, Faculty of Technology. Master's Thesis.

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