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Wavelet-based Decomposition and Artificial Neural Networks for Short-Term Prediction of Power Demand in District Heating

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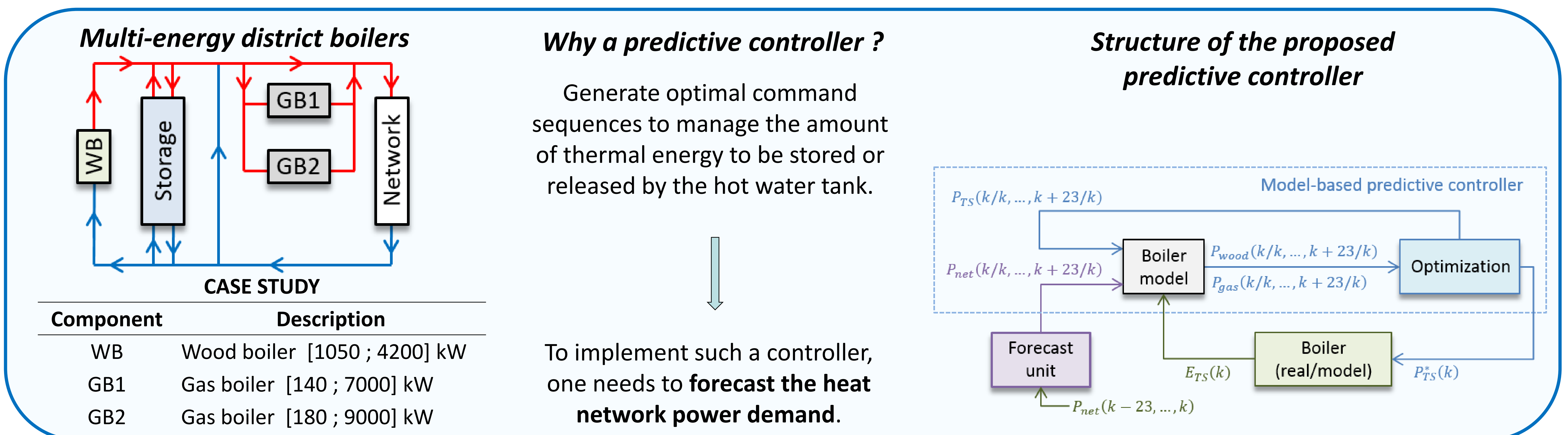
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Objectives

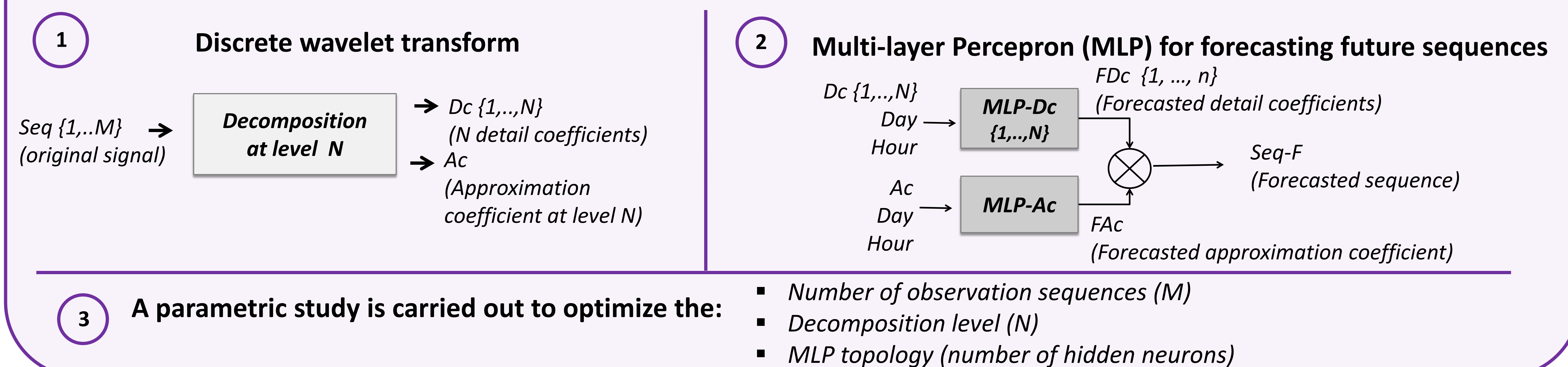
The present work is directed towards improving the operation of multi-energy district boilers by adding to the plants optimally sized and controlled thermal storage tanks. The proposed strategy is based on a Model Predictive Controller (MPC).

Predictive Control of Thermal Storage Systems for Multi-energy District Boilers



Forecast methodology

A model is developed to forecast the power demand as follows:



Simulations Results

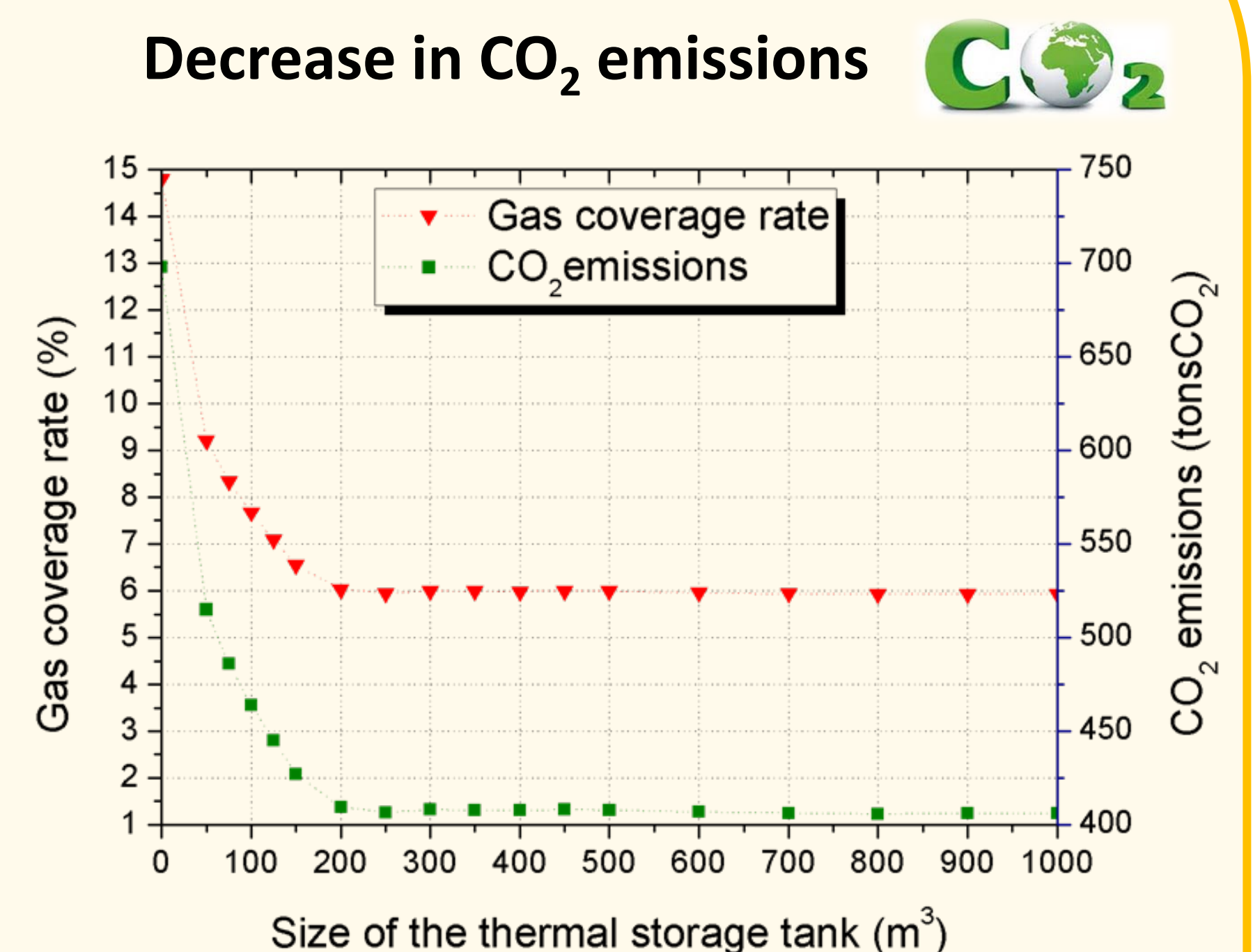
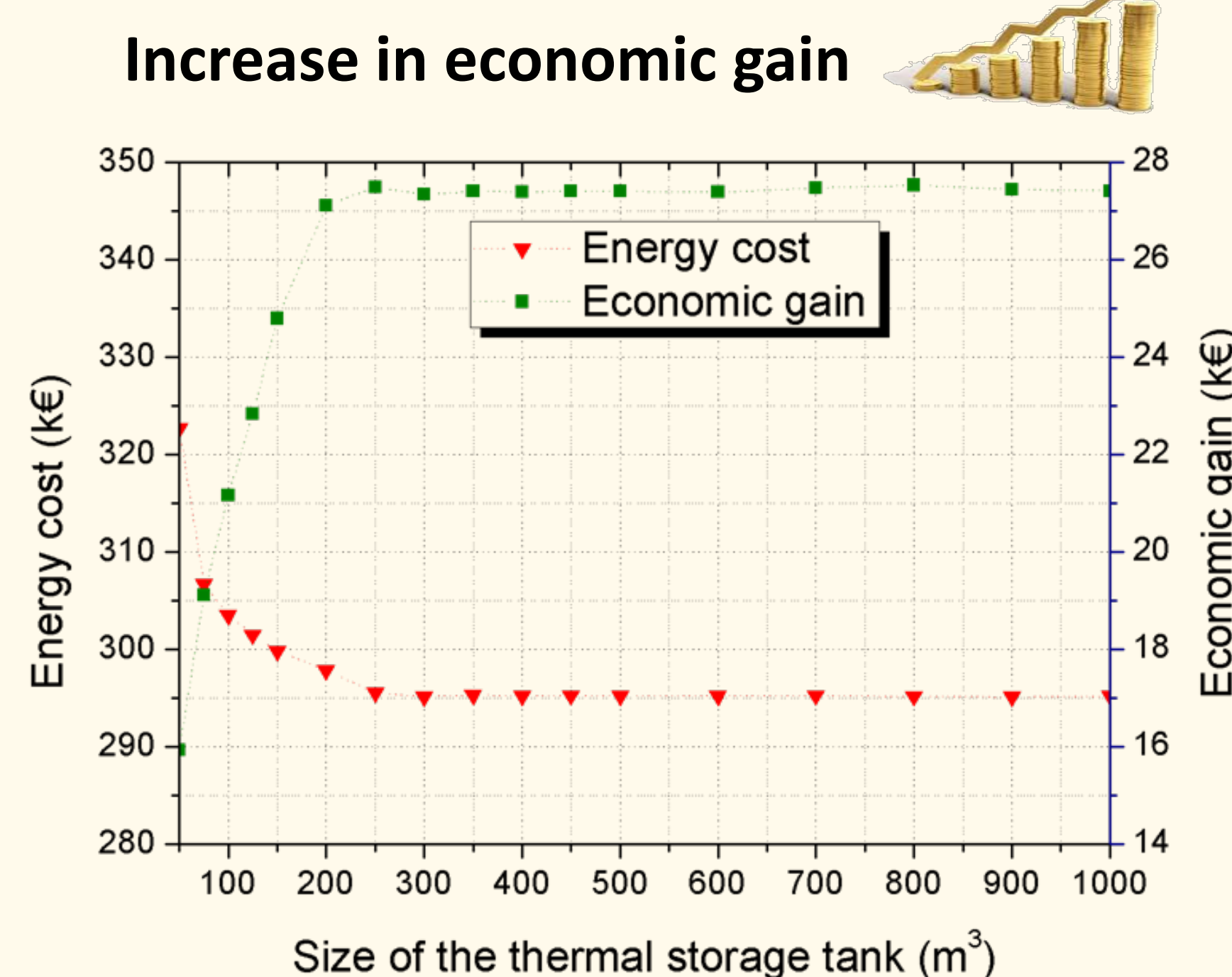
Hourly forecast model (April to September)

OPTIMAL CONFIGURATION

Parameter	Value
Wavelet decomposition level	1
Number of observation sequences	1
Number of hidden neurons	17
FIT (similarity criterion)	72.26
MAE (mean absolute error)	299.57 kW
MRE (mean relative error)	5.9%

- Results highlight the ability of such an approach to achieve the task of forecasting with high accuracy

Impact of the predictive controller



- The proposed control scheme allows the fossil energy consumption to be significantly reduced
- The same remark applies to the functioning costs and CO₂ emissions