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Efficient Energy Use

Energy flow estimation and forecasting for efficient energy system operation

ZOU Guangrong (guangrong.zou@vtt.fi), Kari Tammi, VTT Ltd

Mikael Manngård, Jari Böling, Åbo Akademi

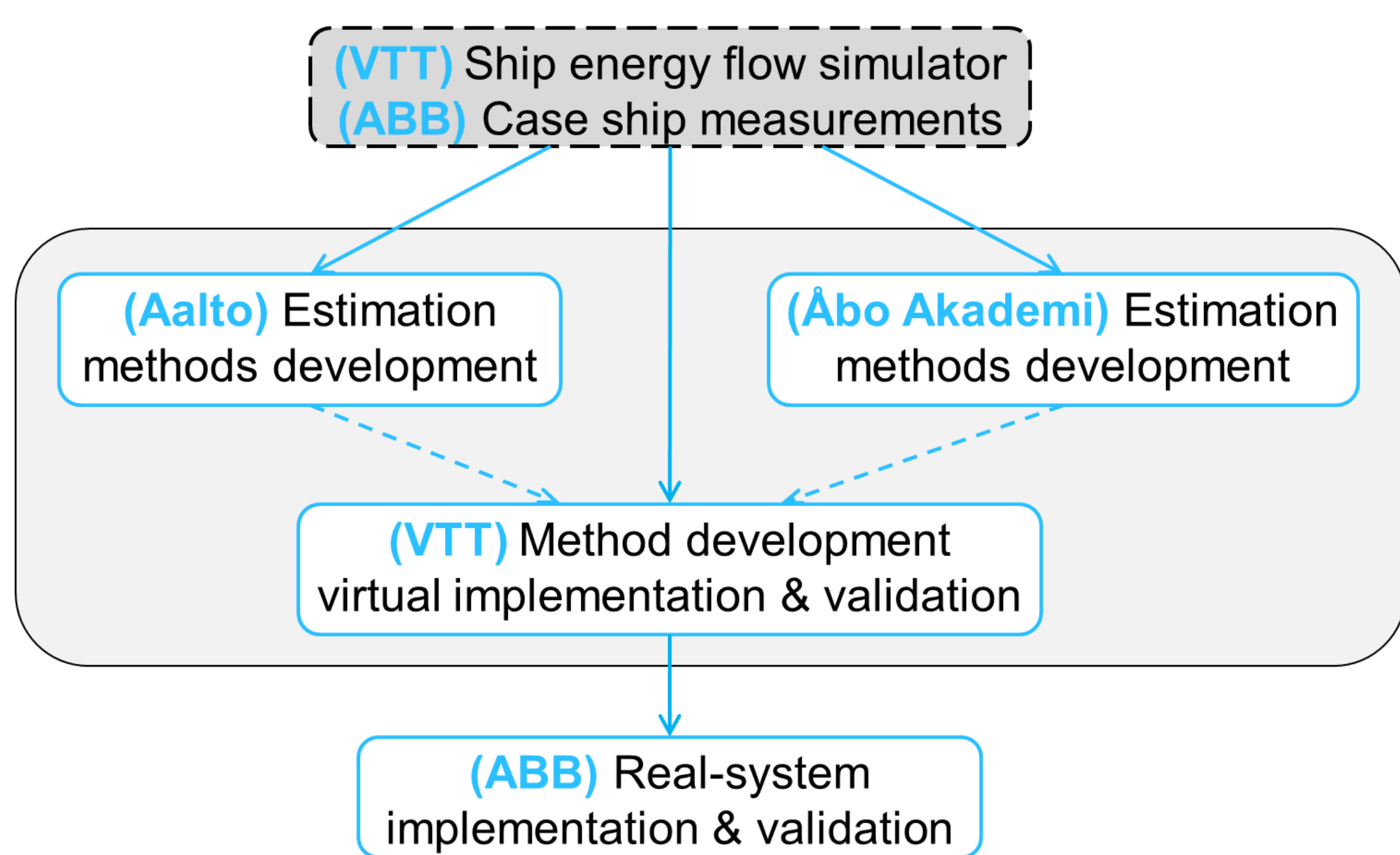
Philipp Nguyen, Robert Tenno, Kai Zenger, Aalto University

Juha Orivuori, Kalevi Tervo, ABB Oy Marine and Ports

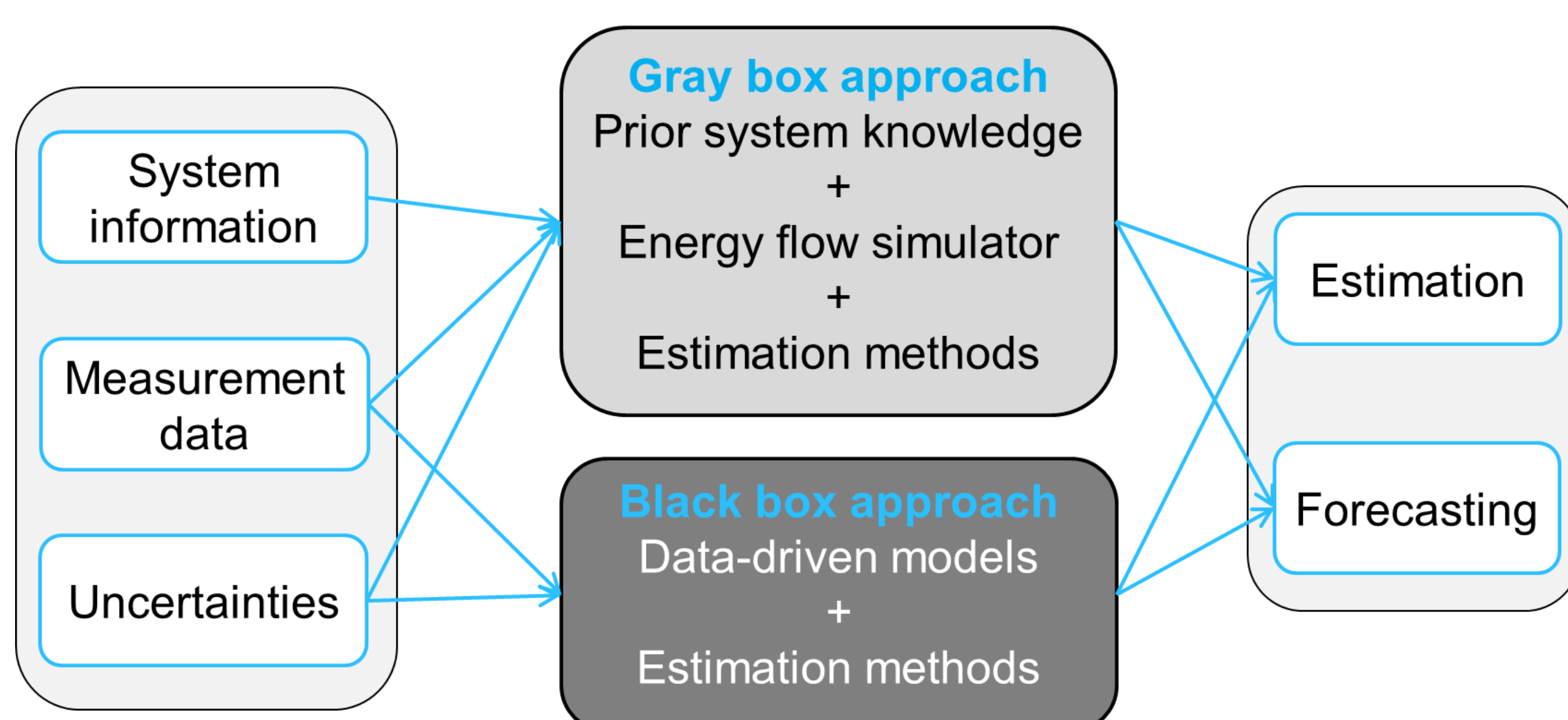
Main Objectives

→ To develop **energy flow simulation, estimation and forecasting** methods for general energy systems, specifically focusing on ship energy systems.

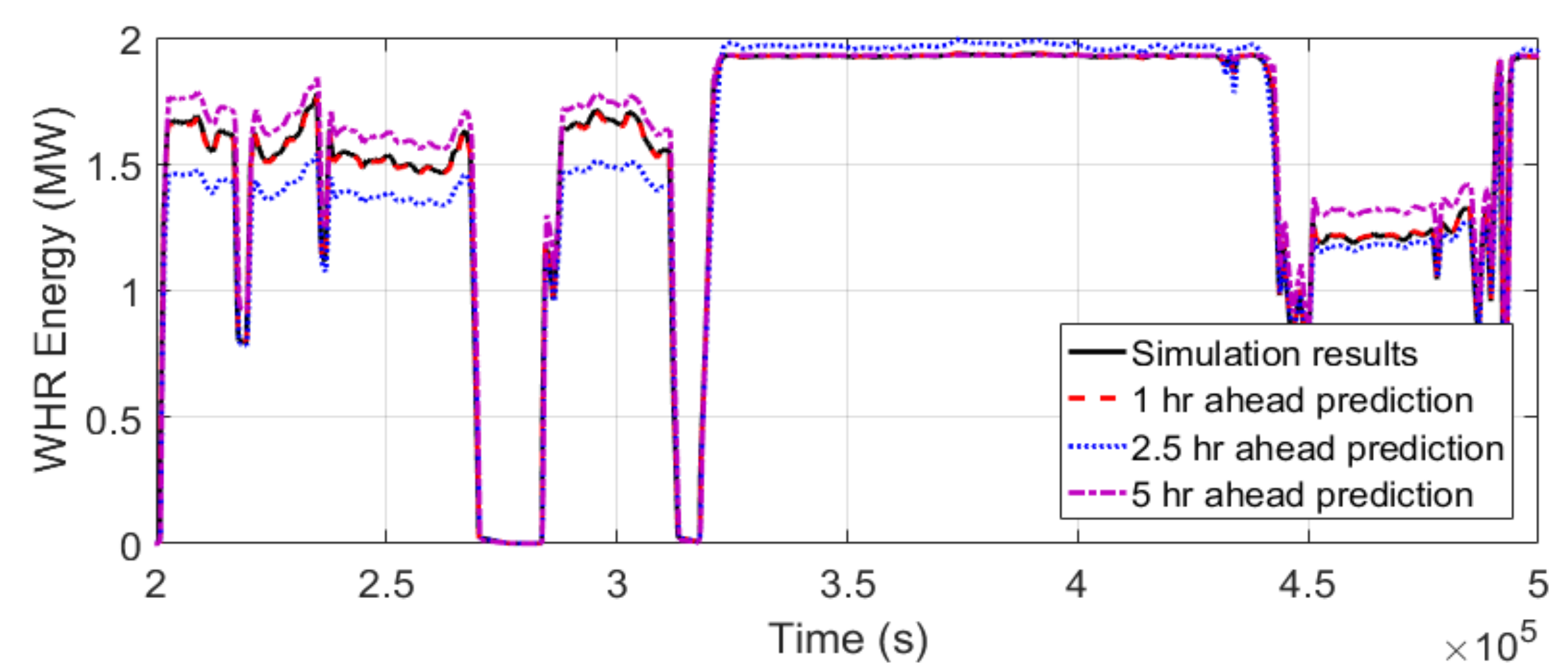
Collaboration Structure



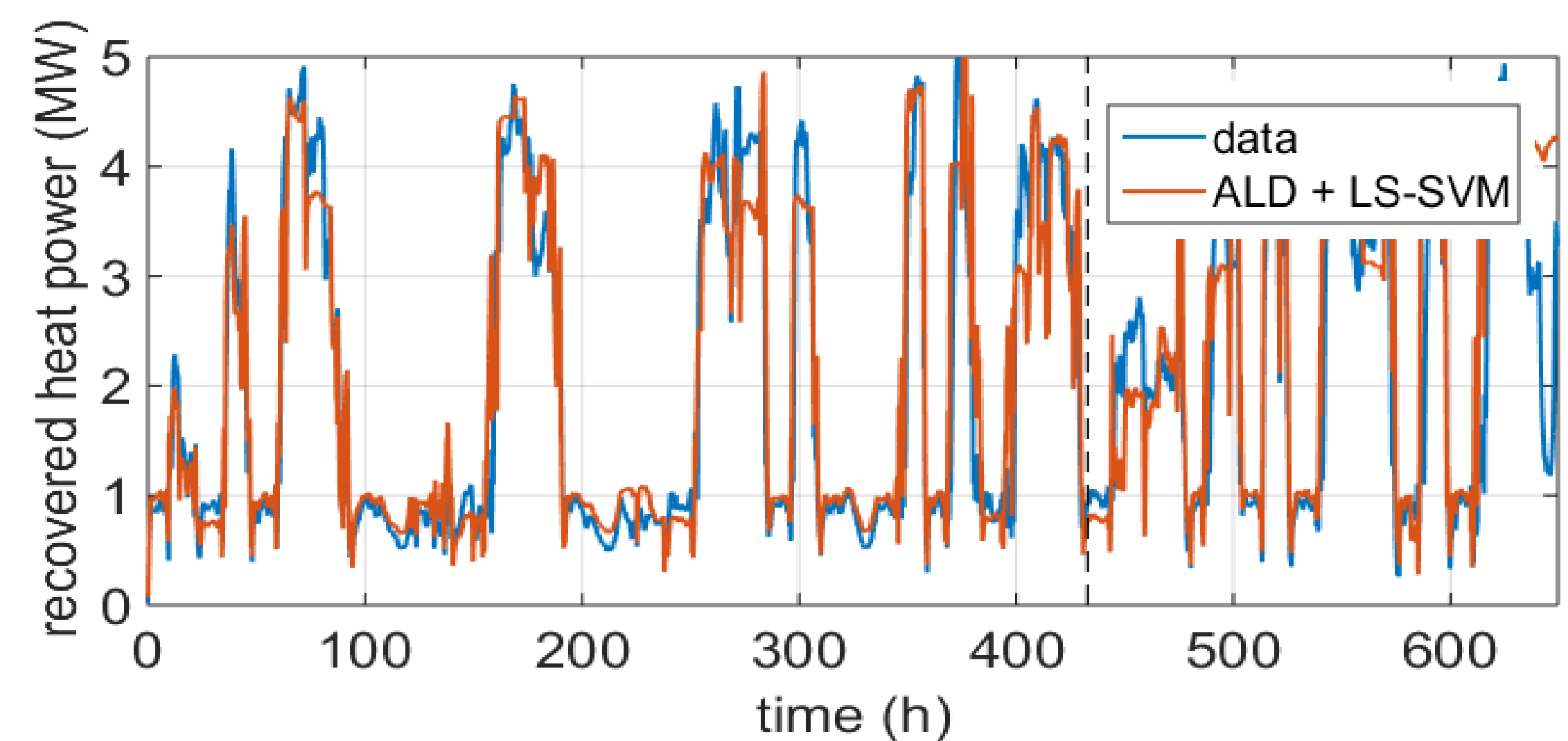
Main Approaches



Example Results



a) Waste heat recovery estimation and forecasting using Regressive Least Squares (RLS) method with different horizons



b) Waste heat recovery estimation and forecasting using Least Squares-Support Vector Machine (LS-SVM) method

Conclusions

- ✓ **Energy flow estimation and forecasting** can provide operators valuable insights into **system operations** with **future aspects** into consideration
- ✓ Both **grey-box** and **black-box** approaches can deliver good estimations within reasonable horizon.
- ✓ The practical performances of energy flow prediction depend on some **key factors of specific approaches**
- ✓ The methods are **general in nature** and easily applicable to other energy systems

