

Optimizing Data Center Cooling: A Model-Based Approach for TCM Integration

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Aim

- This research investigates using Thermochemical Materials Systems (TCMs) in data center (DC) cooling.
- A DC cooling model is developed to evaluate performance of energy efficiency, using conventional cooling technology as a baseline.
- TCMs integration can convert rejected heat from DC cooling, providing both heating and cooling benefits.

Model-Based Systems Engineering

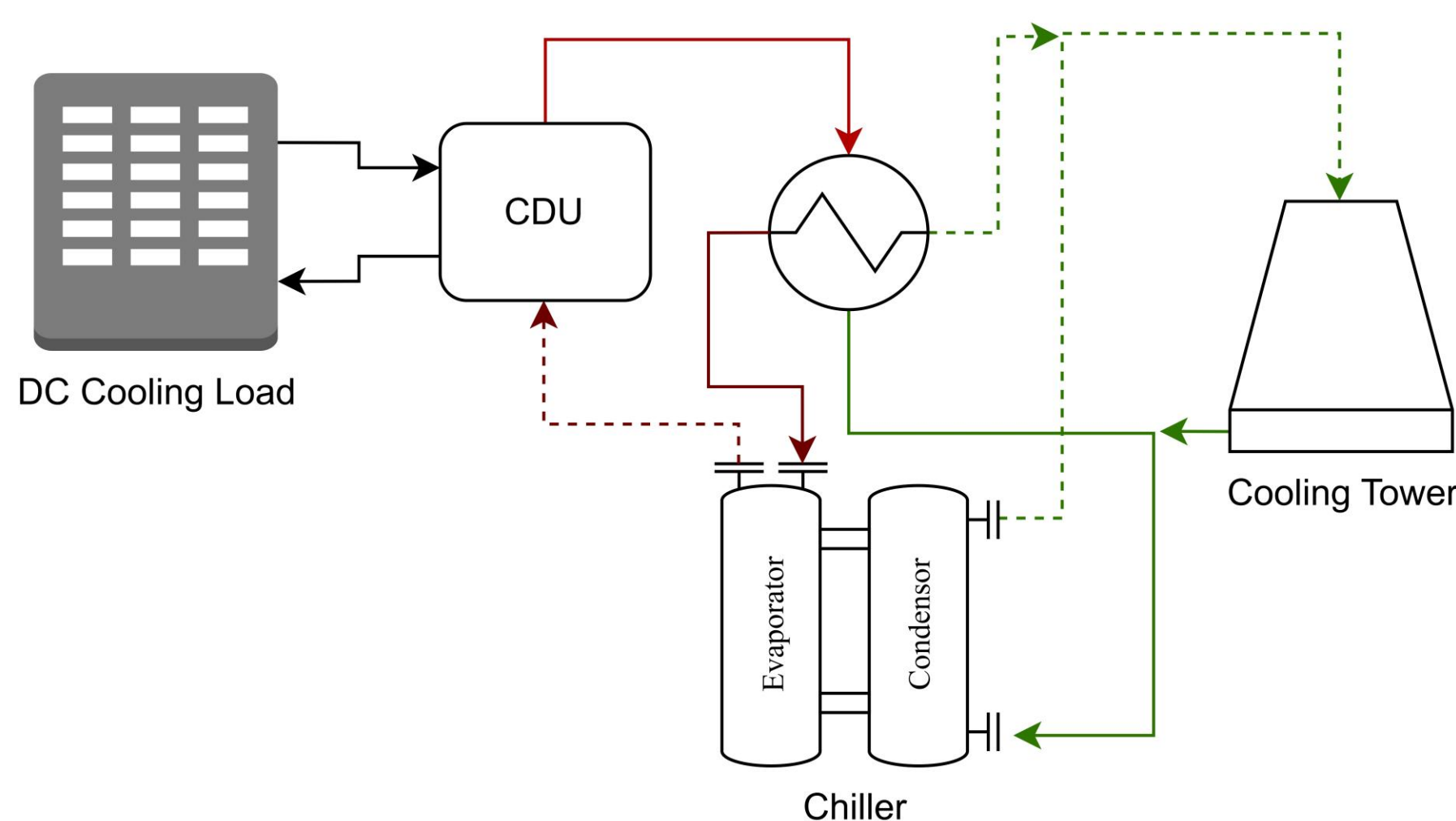


Fig: Conventional DC cooling system with economizer, chiller, and cooling tower.

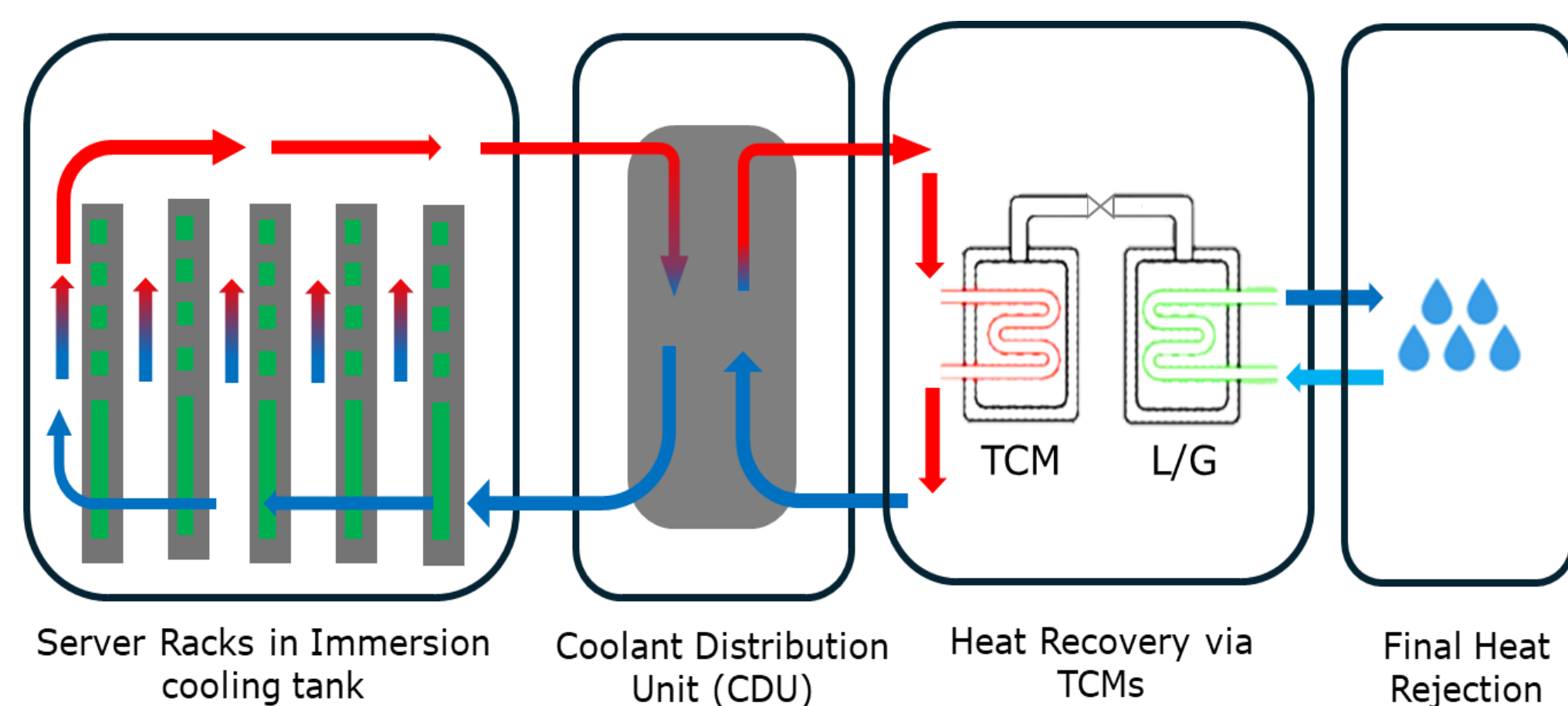
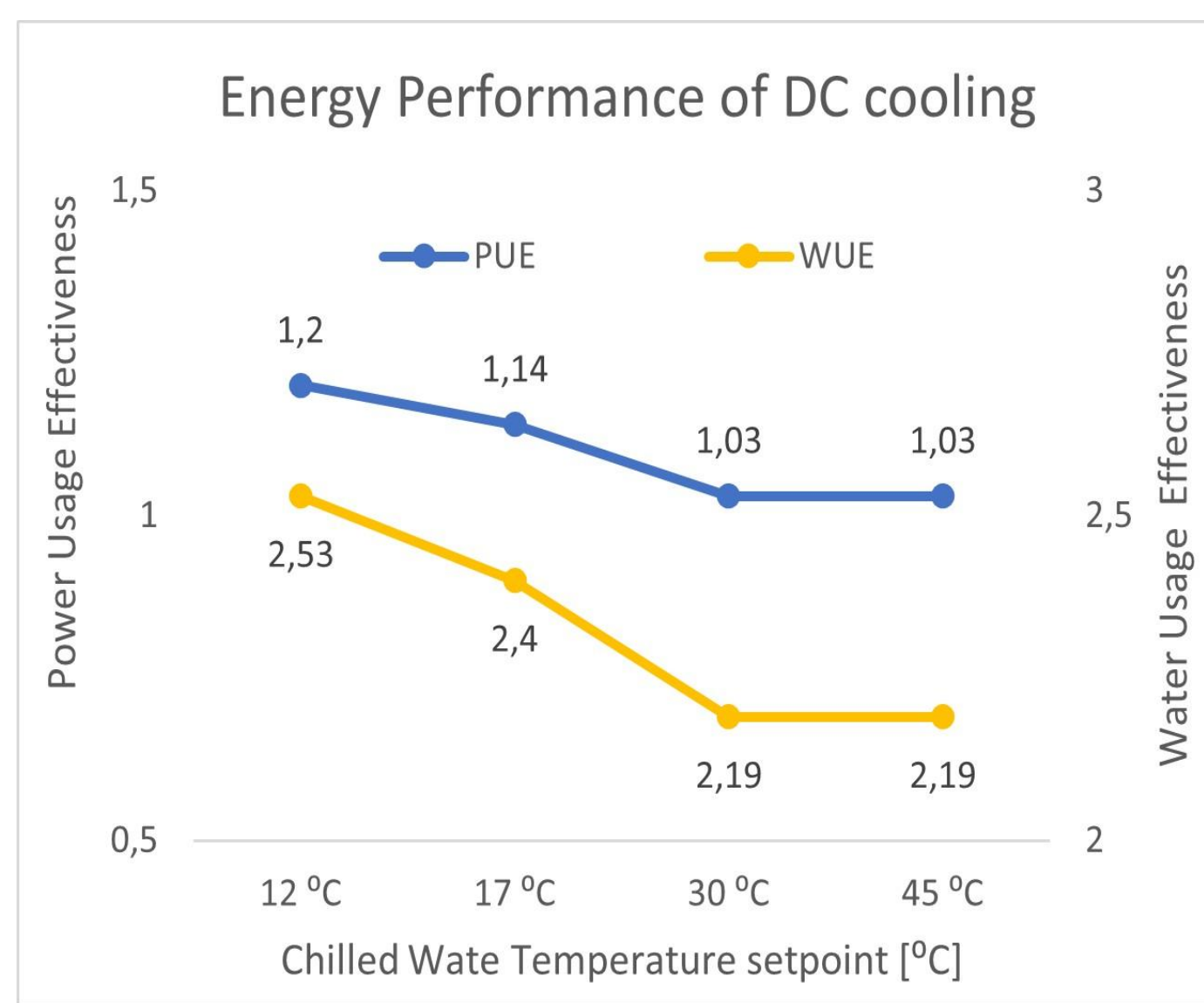
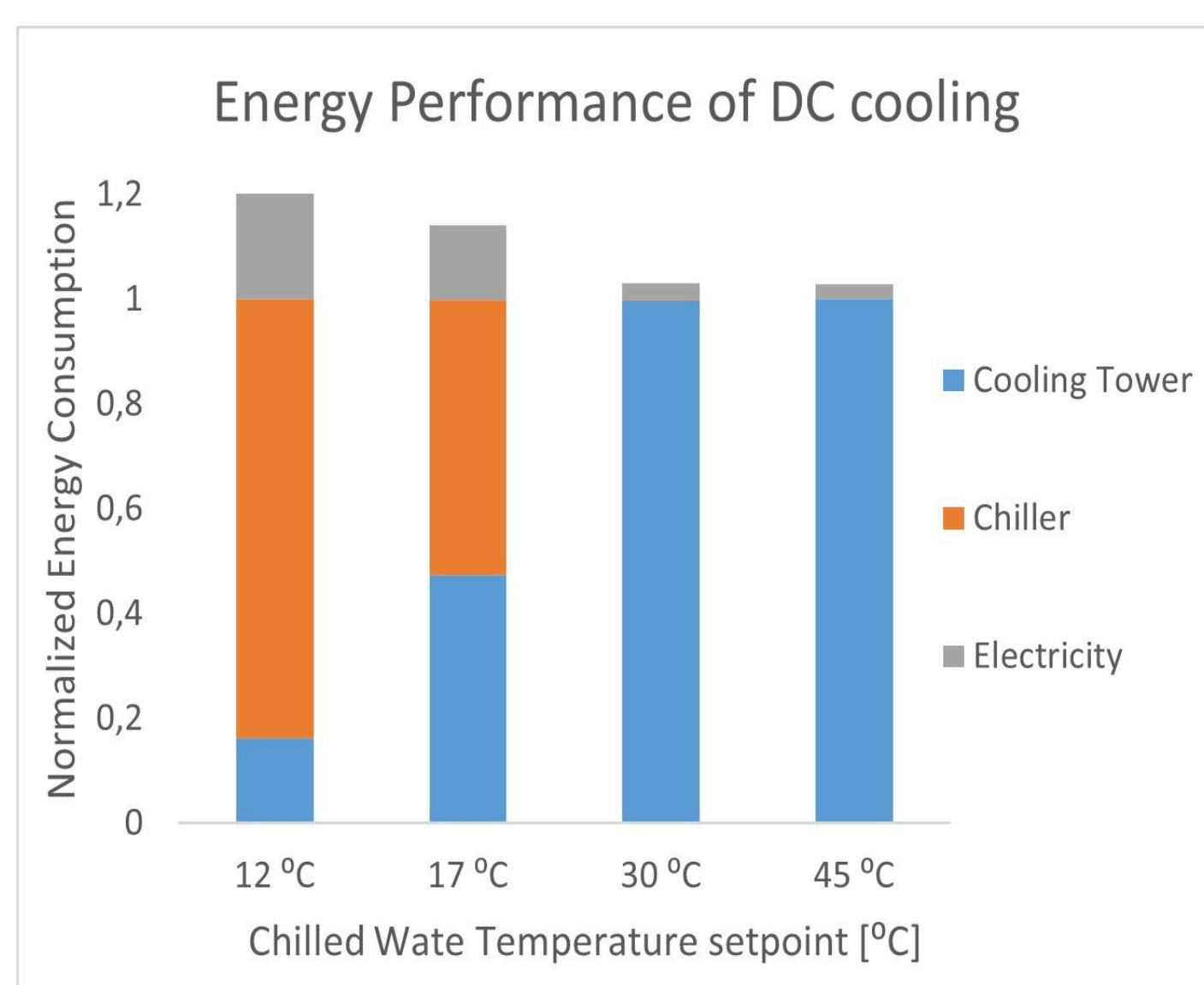


Fig: TCMs-integrated DC cooling system with advanced immersion cooling tech.

Results and Analysis



- Higher cooling setpoints cut chiller use, saving energy and water.
- Energy efficiency is expected to improve further with TCMs thermal upgrading.

Future Work

- Characterizing material for system integration.
- Designing TCMs reactor for optimized heat transfer.
- Establishing digital twin model for TCMs-integrated DC cooling.

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