EFFECTIVE WATER USAGE WITH DEEP REINFORCEMENT LEARNING IN DATA CENTRE

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INTRODUCTION

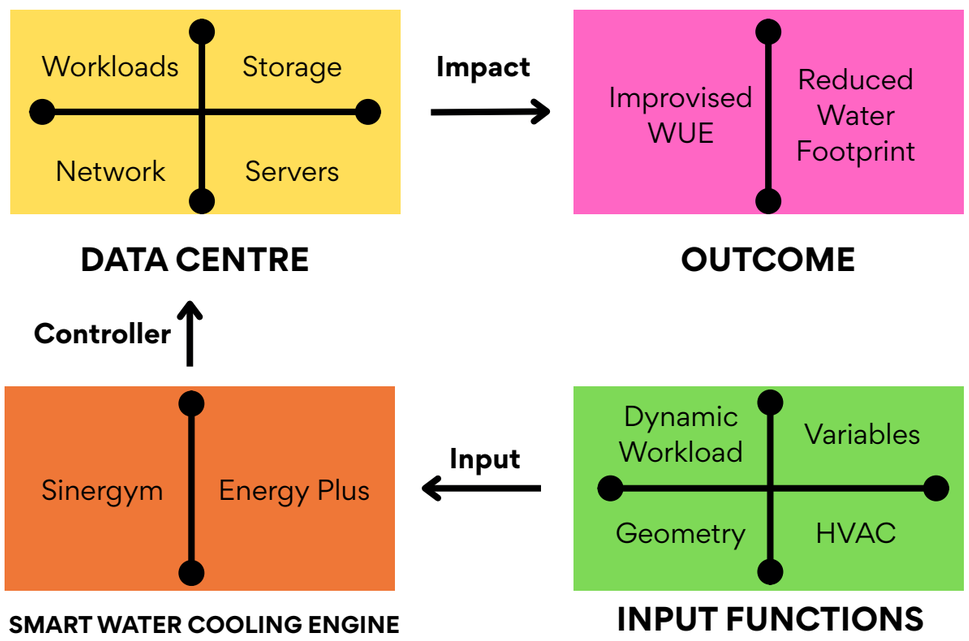
Data centers have been water guzzlers owing to heavy-duty cooling and energy requirements. Globally, very limited efforts have been made in water conservation and Water Utilization Effectiveness (WUE) in Data Centers (DC). The industry standard for WUE is 1.8 L/kWh. This novel research is based on water conservation principle by improvising the WUE in DC.

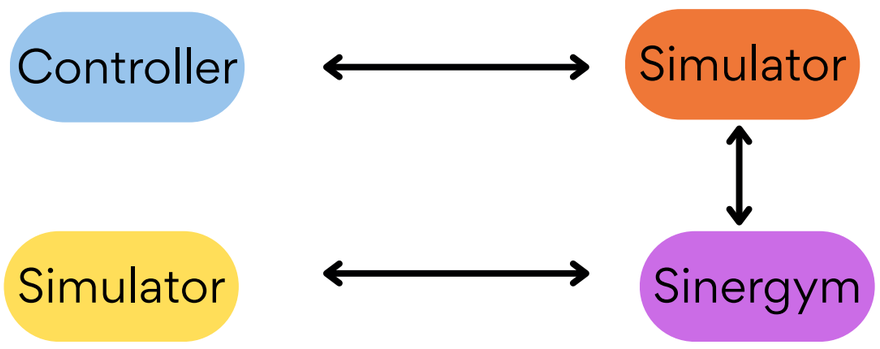
OBJECTIVE

- Improvisation of Water Utilization Efficiency (WUE) in DC
- Reduced water footprint in DC

METHODOLOGY

- A model has been developed that comprises of EnergyPlus, and Python based Deep Reinforcement Learning (DRL) Sinergym.
- A realistic DC has been leveraged to fully test the simulated solution.
- Empirical results show that proposed method can achieve 20.64% WUE.



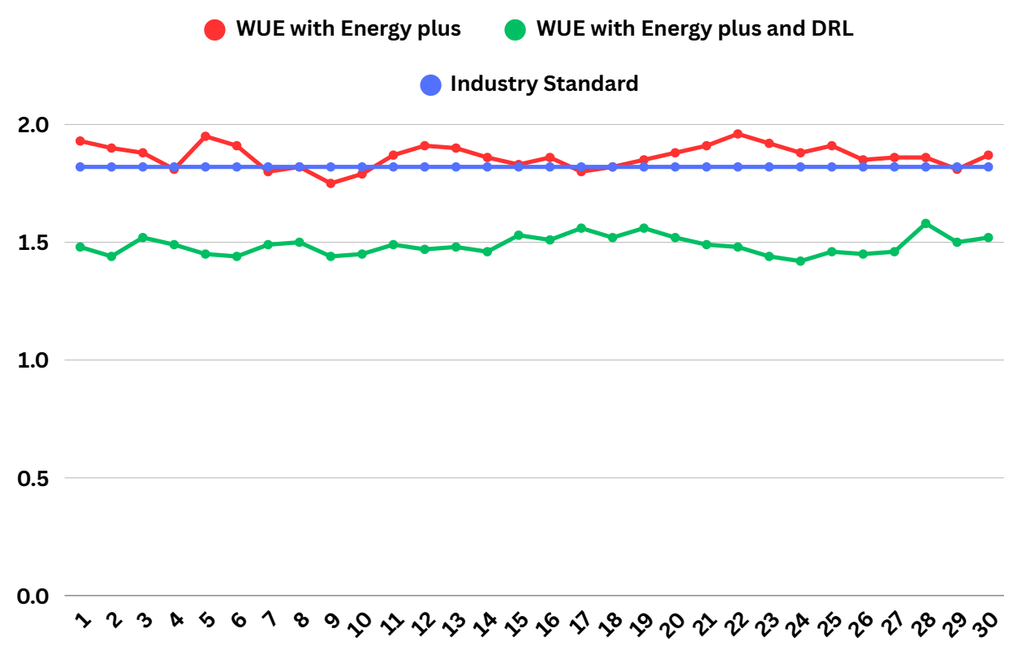


WATER UTILIZATION EFFICIENCY FRAMEWORK

RESULTS/FINDINGS

Empirical results show that proposed method can achieve 20.64% WUE

COMPARISON OF WUE RESULTS



ANALYSIS

Empirical results show that proposed method can achieve 20.6% WUE, and ran smoothly without any safety or operational constraints violation during long-term experiments.

CONCLUSION

- With this integrated solution, being tested in the real time DC, the resultant WUE has outperformed the industry standard.
- Water resource effectiveness results in achieving sustainable Data Center operations.

REFERENCES: ASHRAE STANDARDS AND GUIDELINES (2024); NREL, NATIONAL RENEWABLE ENERGY LABORATORY (2003); ENERGY PLUS (2023); SINERGYM (2021)