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Liquid Cooling in Data Centers Pilot Offering Design Executive Summary

Release Date
September 31, 2023

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Commonwealth Edison Company

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Acknowledgements

This project was developed as part of the Emerging Technologies initiative within the ComEd Energy Efficiency Program under internal project number P-0676. Energy Resources Integration (ERI) produced this report for the Emerging Technologies Team with overall guidance and management from Steven LaBarge. For more information on this project, contact EmergingTech@ComEd.com.

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1.0 EXECUTIVE SUMMARY

In an era defined by unprecedented growth in digital data consumption and processing demands, data centers stand as the lifeblood of modern technological infrastructure. Amidst an influx of companies constructing new data centers and retrofitting buildings to expand data center capacity within ComEd territory, ComEd is positioned to undertake an innovative endeavor. This venture is aimed at reshaping the data center cooling landscape, in direct response to the escalating need for energy efficiency and sustainability in this domain.

This pilot initiative marks a crucial milestone in the collaborative effort between ComEd and its partners to assess the feasibility, efficacy, and practicality of liquid cooling solutions for data centers operating within the state of Illinois. Building upon the insights garnered from the preliminary phases of this project, which included an extensive literature review (Phase 1) and comprehensive market study involving surveys and interviews (Phase 2), this pilot initiative is designed to showcase the tangible benefits of liquid cooling technologies in real-world data center settings.

Introduction

Traditionally, the majority of current information technology (IT) equipment in data centers and in other applications has been air-cooled. While this remains true for most applications, liquid cooling (LC) technologies have been gaining market share in recent years, in large part due to increasing computer hardware power consumption and increasing data center power density. In liquid-cooled equipment, heat is rejected to a coolant, which can then be rejected to a chilled water or condenser loop. While these LC technologies are currently used to increase the cooling capacity in high-density data centers, the same principles can be applied to all IT capacities which improve their energy performance. In lower-efficiency, air-cooled data centers, the energy used to cool equipment can often exceed the amount of energy used by the equipment itself, while data centers using LC may reduce cooling energy to 10 percent or less of the equipment energy use. Therefore, expanding the use of LC in data center applications where air-cooling would be standard practice has significant energy savings potential. Depending on data center size and baseline equipment configuration, LC offers up to 95 percent savings on cooling energy, or up to 50 percent savings on total data center energy consumption. LC also offers non-energy benefits, including the reduction of dust buildup, reduction of required maintenance, and the reduction of noise levels (by up to 30 dB) in data center spaces.

2.0 CONCLUSION

This pilot offering marks a significant step forward in addressing the pressing concerns of energy efficiency and sustainability within the data center landscape. The collaborative effort with ComEd has allowed us to strategically structure the program, considering the surge in new data center constructions and retrofit projects within the ComEd territory.

The groundwork laid in the literature review and market assessment phases has proven insightful in shaping the pilot's direction. The insights gained from these phases have led us to focus on two distinct approaches: Submersion Cooling for new constructions and Rear-Door Heat Exchanger for retrofit projects. These choices were guided by the technologies' potential to address the needs of varying data center sizes and construction scenarios.

In moving forward with the pilot, we anticipate pragmatic insights that will shape data center cooling strategies. Through the evaluation of immersion cooling and rear-door heat exchanger technologies, we aim to provide tangible data on their energy efficiency and cost-effectiveness. These findings will serve as practical guides for data center operators considering technology adoption.

As we look forward to launching this pilot offering, there are several key steps that the ComEd Emerging Technologies Team should consider for successful execution. First and foremost, a detailed communication plan should be devised to engage potential participants and stakeholders. Clear and compelling messaging will be crucial in conveying the value proposition of the pilot and encouraging data center operators to participate. Collaborating closely with industry partners and organizations can also facilitate broader buy-in and support.

Furthermore, assembling a multidisciplinary project team comprising technical experts, data analysts, and project managers will ensure the seamless execution of the pilot. This team will be responsible for overseeing the implementation of Target A and Target B scenarios, including the selection of participants, technology integration, and data collection.

In preparation for the pilot launch, it's recommended to establish partnerships with technology providers and manufacturers, securing the necessary equipment and resources. Finally, the team should outline a comprehensive timeline that details the various phases of the pilot, from participant recruitment and technology deployment to data analysis and reporting.

The proposed pilot embodies ComEd's commitment to driving change in the data center industry. By leveraging insights from this study, ComEd is positioned to contribute substantively to the ongoing dialogue on sustainable data center operations. As the outcomes of this pilot unfold, we are poised to influence industry practices, promote innovation, and contribute to a more environmentally conscious approach to data center cooling.