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CSA C510:21
National Standard of Canada

Ideal state benchmarking and application of benchmark energy factor for data centres

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Preface

This is the first edition of CSA C510, *Ideal state benchmarking and application of benchmark energy factor for data centres*.

This Standard applies to the use of electrical energy for data centres.

CSA acknowledges that the development of this Standard was made possible, in part, by the financial support of BC Hydro, Efficiency Manitoba, Hydro Quebec, Canadian Electricity Association, Independent Electricity System Operator (IESO), Nova Scotia Department of Energy and Mines, EfficiencyOne, and NEEA.

This Standard is considered suitable for use for conformity assessment within the stated scope of the Standard.

This Standard was prepared by the Subcommittee on Benchmark Energy Factor-Data Centres, under the jurisdiction of the Technical Committee on Heating, Ventilation, Air Conditioning, and Refrigeration and the Strategic Steering Committee on Performance, Energy Efficiency, and Renewables, and has been formally approved by the Technical Committee.

This Standard has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

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0 Introduction

0.1 General

The CSA benchmark energy factor (BEF) standard is the first data centre energy efficiency standard in the world that deals with the efficiency for data centre information technology (IT) electrical loads. Other data centre energy efficiency standards, such as the power utilization effectiveness (PUE), treat data centre IT loads as always being 100% efficient; however, IT data centre loads can often be far from 100% efficient.

In an example of two data centres given in Annex B, it is clear that failure to consider the actual efficiency of the IT load causes significant disparities in true data centre energy performance. To note the key point here in this example is that both data centres have the same PUE indexes, whereas the BEF indexes are quite different.

The benchmark energy factor (BEF) can be defined as the ratio between the total energy (E_{used}) (prior to any efficiency improvements being implemented) and the essential energy (E_{ess}). The essential energy is the minimum energy used to provide all necessary useful work at the required performance levels.

This Standard breaks out the BEF's essential energy for data centres' entire electrical loads including IT, mechanical, power delivery, and lighting.

In today's economic environment, business sustainability requires highly efficient technological processes that will increase the business's competitiveness. Businesses require the utilization of energy to run processes using the most cost-effective way, whereby waste energy is minimized and energy productivity maximized.

The main drivers of energy efficiency are
a) energy availability;
b) energy reliability;
c) energy productivity;
d) energy cost-effectiveness; and
e) energy sustainability.

One of the barriers to energy efficiency improvement is the lack of an accurate, repeatable, and comparable benchmarking methodology. This is particularly true for data centres. Traditional benchmarking methodologies used for data centres are typically based on energy efficiency relative to the IT subsystem. But these methods do not take into account the efficiency of the IT subsystem itself.

Over the past decade, there have been significant advances in the energy efficiency of IT compute, storage, and networking equipment, and in application efficiency through virtualization, operating