

# APC: Electrical efficiency measurement for data centres

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Data centre electrical efficiency is rarely planned or managed. The unfortunate result is that most data centres waste substantial amounts of electricity. Today it is both possible and prudent to plan, measure, and improve data centre efficiency. In addition to reducing electrical consumption, efficiency improvements can gain users higher IT power densities and the ability to install more IT equipment in a given installation. This paper explains how data centre efficiency can be measured, evaluated, and modelled, including a comparison of the benefits of periodic assessment vs. continuous monitoring.

In today's environment, it is good public policy and good business to consider the options to control data center energy consumption.

A 1MW high availability data center can consume \$20,000,000 of electricity over its lifetime.

Recent articles suggest that for some customers the cost of electricity is greater than the cost of IT hardware.

Many companies are beginning to consider the carbon consumption of their ongoing operations and realizing that data centers are significant contributors to the environmental burden of business and industry.

Research by APC-MGE and others is showing that efficiency varies widely across similar data centers, and - even more significant - the actual efficiencies of real installations are well below the practical achievable best-in-class values.

In this paper, we will focus on the power consumption and efficiency of data center power and cooling infrastructure, which consumes 50% or more of the electrical power in a typical installation.

The power consumption and efficiency of the actual IT equipment supported by the power and cooling infrastructure, while critically important to overall energy use, is not the subject of this paper.

You can't control what you can't measure.

The first problem users face is that they don't have data regarding the performance of their facilities.

In addition, even if they do have data, they don't know how to evaluate it.

They don't know how to compare or benchmark their performance to the efficiency of other similar facilities.

They don't even know how to compare the actual data to the as-designed performance they should expect from their facilities.

In 2008, most users don't have efficiency data - and even if they did, they wouldn't know how to act on it.

Solving these problems requires:

- A standard language for describing data center efficiency
- A standard method for measuring data center efficiency
- A standard method for specifying data center efficiency
- A standard method for analyzing data center efficiency and determining the contributors to inefficiency
- Benchmark data relating to efficiency
- Efficiency modeling tools to assess proposed improvements or alternative designs

Fortunately, there are no fundamental practical or technical barriers to achieving these objectives.

In fact, this paper asserts that data center operators should consider the management of efficiency as a top priority for both existing and new data centers.

This paper addresses all of the above issues, except the specification of data center efficiency.

- The concept of data center electrical efficiency
- Metric for data center electrical efficiency
- Effect of IT load on efficiency
- Effect of outdoor conditions on efficiency
- Effect of user configuration and settings on efficiency
- Combined effect of condition variations on efficiency
- Efficiency modeling of data centers
- Preparing an efficiency measurement plan
- Identification of electrical circuits to be measured
- Instrumentation for efficiency measurement
- Data collection during efficiency measurement
- Establishing a system for reporting efficiency

(AME Info)