ENVIRONMENT & SUSTAINABILITY
UI INTELLIGENCE REPORT 65

# Reducing the energy footprint

## Digital infrastructure sustainability – A manager's guide

EXECUTIVE SUMMARY

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The first objective of a sustainability plan is to minimize energy use through conservation and efficiency measures — primarily by maximizing the IT work delivered per unit of energy used by the IT and facilities infrastructure. Increasing the amount of renewable electricity in the electricity supply will provide further environmental benefits.

**Author**
Jay M. Dietrich, Research Director of Sustainability, Uptime Institute

**Series Editor**
Andy Lawrence, Executive Director of Research, Uptime Institute

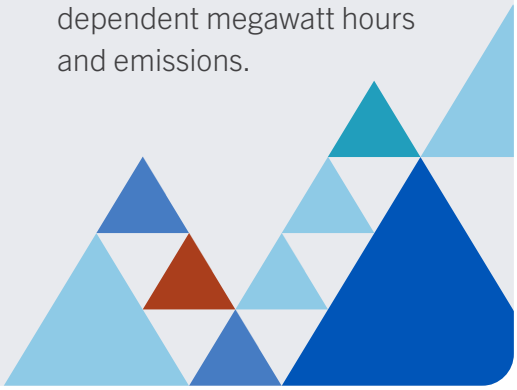
**This is an excerpt from the Uptime Intelligence report *Reducing the energy footprint*. This is the third of six reports in the series 'Digital infrastructure sustainability strategy – a managers guide'. For more information see page 7 of this document or visit uptimeinstitute.com/ui-network**

# Synopsis

An energy management program is the cornerstone of a sustainability strategy. The first objective should be to minimize energy use through conservation and efficiency measures — maximizing the IT work delivered per unit of energy consumed within the data center.

Power use effectiveness is a key metric, but it only covers facilities efficiency. IT systems also need to be optimized to minimize energy consumption. Increasing the amount of renewable electricity used can provide further environmental benefits — primarily the reduction of greenhouse gas emissions.

- Energy use should be metered — submeters are recommended for office, facility and IT power consumption.
- Data relating to the grid generation mix should be collected for each data center from energy suppliers or available databases.
- Many existing operational metrics can double as sustainability metrics.
- The strategy should emphasize and incentivize innovation that increases operational efficiency.
- Operators should increase the amount of renewable energy consumed at the data center and only use unbundled renewable energy certificates to match unavoidable carbon-dependent megawatt hours and emissions.



EXECUTIVE SUMMARY

# Contents



# Illustrations



**Uptime Institute Intelligence** is an independent unit of Uptime Institute dedicated to identifying, analyzing and explaining the trends, technologies, operational practices and changing business models of the mission-critical infrastructure industry. For more about Uptime Institute Intelligence, visit uptimeinstitute.com/ui-intelligence or contact research@uptimeinstitute.com.

# Introduction

Energy consumption by data centers has a significant environmental impact — i.e., greenhouse gas (GHG) emissions — and has a significant operating cost. Operations teams should develop a comprehensive plan for measuring energy consumption, collecting data and calculating metrics for all energy-consuming systems.

Management analysis of this energy-related data can help to direct and motivate the operations teams to reduce the use of energy for a given quantity of IT work. Tracking these measurements and metrics should be embedded in routine business processes and operations.

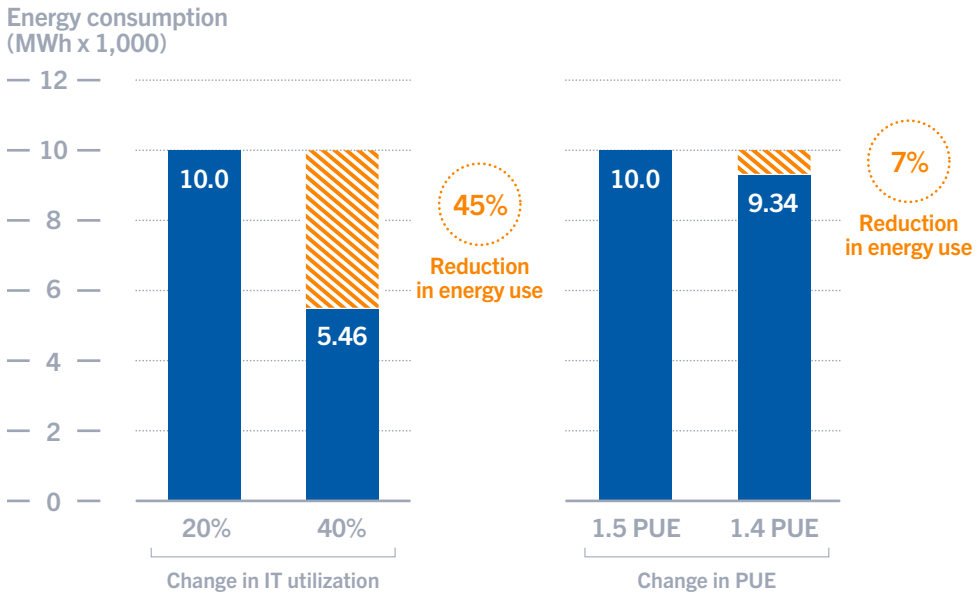
A sustainability strategy should also ensure that renewable or low-carbon power is used as much as possible. This can involve complex and potentially expensive sourcing strategies. In a data center context, opportunities for on-site renewable energy generation are usually limited.

The single most effective lever that can be used to minimize and optimize energy consumption is to improve IT equipment efficiency. Managers can influence (and improve) up to 90% of data center energy and water use by changing the equipment counts and configurations and managing IT workloads. Improving IT equipment utilization efficiency has a significantly higher impact on energy consumption than increasing the energy efficiency of facilities operations, measured by power use effectiveness (PUE).

**Figure 1** shows that doubling IT equipment utilization — which is often feasible — can enable the removal of roughly half the server or storage equipment. Because the remaining servers run at higher power — for an Intel Gold 6230 Xeon processor, 286 watts (W) at 40% utilization versus 267 W at 20% utilization (per The Green Grid database) — energy consumption is reduced by 45%.

By comparison, 20% improvement in PUE only achieves a 7% energy use reduction (on a PUE reduction from 1.5 to 1.4). Improving utilization of IT equipment reduces IT and cooling energy use, and water use, while a PUE reduction only reduces cooling energy and water use.

**Figure 1** **Relative benefits of equipment efficiency improvements: IT / facilities**

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At most data centers IT efficiency objectives have a lower priority than reliability and performance metrics. Managers can, however, work with the IT operations team to set improvement goals for equipment utilization — for example, deploying or enabling power management functions and power-aware workload placement software. This can improve the economics of the operation, reduce the environmental impact, drive up productivity for each unit of energy consumed, and reduce or mitigate the growth of data center energy use.

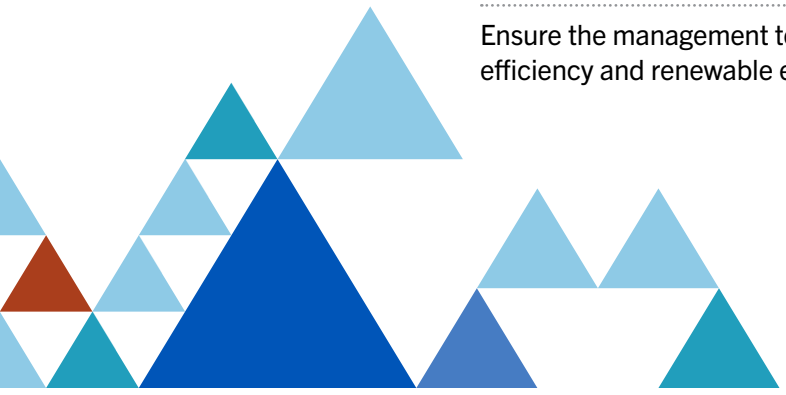
Although there are still significant opportunities for energy efficiency improvements in facilities operations, IT operations offer greater opportunities for a reduction in energy use. Any efficiency improvements should, of course, be undertaken within the constraints of the data center resiliency, reliability and performance requirements.

Research shows that these efforts are also of interest to customers and clients. **Figure 2** shows that IT operators considering deploying to a colocation facility place a high value on efficient infrastructure and the availability of renewable energy in their analysis of options.

# Key advisory points

**An energy management plan should:**

- Minimize energy use through conservation and efficiency measures, within the constraints of resiliency and reliability requirements.
- Optimize both facilities and IT systems to minimize energy consumption. Older facilities have the highest opportunity for efficiency improvements; newer facilities should have incorporated efficiency initiatives in the siting, design and construction process.
- Set an energy conservation goal as an MWh value of energy use avoided and saved over a defined 12-month period.
- Incentivize innovation to increase operational efficiency and integrate energy generated from zero-emissions sources (e.g., wind, solar, hydroelectric, nuclear).
- Create and track operating metrics and inventories to monitor system performance and efficiency in terms of energy efficiency and sustainability goals.
- Ensure a consistent set of metrics and goals are applied across all IT operations and services (including colo and cloud providers).
- Increase the percentage of renewable energy supplied directly to the operating facilities — but recognize that with current technology, a data center cannot reliably operate on 100% renewable energy until all generation capacity within a grid zone is zero emissions.
- Set renewable energy use and procurement goals as a percentage of actual and / or matched electricity consumption to be achieved by a certain date.
- Collaborate closely with the financial, procurement and legal teams (and cloud and colo providers) to define acceptable terms, conditions and costs of renewable energy purchases.
- Build strong relationships with energy retailers, utilities, project developers and consultants to identify and develop economically acceptable opportunities to procure renewable energy and RECs. (Note that unbundled RECs are not needed to match grid-mix nuclear and renewable energy generation.)
- Satisfy customers with a clear carbon reduction strategy for improving energy efficiency and increasing renewable energy purchases.
- Ensure the management team is committed to achieving the energy conservation, efficiency and renewable energy procurement goals.



EXECUTIVE SUMMARY

Appendix 2

Digital infrastructure sustainability – A manager's guide

# Reports in the series

'Digital infrastructure sustainability – A manager's guide' is a series of Uptime Institute Intelligence reports that guide managers and responsible operators through the complex set of issues involved in creating an environmental sustainability strategy for data centers and associated digital infrastructure. The reports outline the strategies, the terminologies and the approaches involved; explain the key areas that must be covered by an environmental sustainability strategy and how progress should be measured and reported; and provide guidance on how to navigate some of the intricacies and challenges involved. These reports do not constitute a blueprint environmental strategy or a new standard but provide pragmatic, actionable advice for managers who must navigate this critical area.

The series includes the following reports:

### Creating a sustainability strategy

All those who operate digital infrastructure must have a sustainability strategy that spans all facilities and IT operations and addresses the needs of all stakeholders.

### Tackling greenhouse gases

Operators of digital infrastructure must have a greenhouse gas emissions reduction goal that takes into account Scope 1, 2 and 3 emissions — and they must report these reductions in accordance with agreed policy.

### Reducing the energy footprint

The first objective of a sustainability plan is to minimize energy use through efficiency measures. Further benefits will be realized by replacing electricity from nonrenewable sources with renewably generated energy.

### IT efficiency: the critical core of digital sustainability

A digital sustainability strategy should incorporate both the facilities and IT operations, even for colocation operators. This report covers strategies, software tools and metrics that can help drive up IT efficiency.

### Three key elements: water, circularity and siting

This report discusses three important elements of the sustainability strategy: water use; siting, including design and certification; and reuse, disposal and recycling. Addressing these elements can significantly reduce the environmental impact of digital infrastructure.

### Navigating regulations and standards

Critical digital infrastructure is subject to an expanding set of regulations, directives and standards, with varying levels of maturity and acceptance. Most are voluntary, but more are becoming mandatory.

### Glossary of digital infrastructure sustainability

This document explains the key terms used by those defining, regulating and applying digital infrastructure sustainability strategies.

# Find out more

## Uptime Institute and sustainability

Uptime Institute has been advising members and clients on sustainability and digital infrastructure for more than 15 years. Access to all the reports in this series is free to members of the Uptime Institute, along with access to events, webinars, roundtable discussions, peer-to-peer networks and expert enquiry.

For information on becoming a member please visit:
**uptimeinstitute.com/ui-network**
or contact **info@uptimeinstitute.com**

For media enquiries please contact:
**bsouth@uptimeinstitute.com**

To discuss issues with the author please email:
**sustainability@uptimeinstitute.com**

Uptime Institute offers sustainability consulting services, education and advisory support.
For more information:
**info@uptimeinstitute.com**
+1 212 505 3030
or contact a local Uptime Institute representative.

## About Uptime Institute

Uptime Institute is the Global Digital Infrastructure Authority. Its Tier Standard is the IT industry's most trusted and adopted global standard for the proper design, construction, and operation of data centers – the backbone of the digital economy. For over 25 years, the company has served as the standard for data center reliability, sustainability, and efficiency, providing customers assurance that their digital infrastructure can perform at a level that is consistent with their business needs across a wide array of operating conditions. With its data center Tier Standard & Certifications, Management & Operations reviews, broad range of related risk and performance assessments, and accredited educational curriculum completed by over 10,000 data center professionals, Uptime Institute has helped thousands of companies, in over 100 countries to optimize critical IT assets while managing costs, resources, and efficiency.

Uptime Institute is headquartered in New York, NY, with offices in Seattle, London, Sao Paulo, Dubai, Singapore, and Taipei.

For more information, please visit **www.uptimeinstitute.com**

### All general queries:

Uptime Institute
405 Lexington Avenue,
9th Floor, New York,
NY 10174, USA
+1 212 505 3030
**info@uptimeinstitute.com**