



Data Center Energy Efficiency,
Renewable Energy and Carbon Offset
Investment Best Practices

*A Guide to Greening Your Organization's
Energy Consumption*

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Executive Summary

Organizations can benefit immensely by lowering their energy use and greenhouse gas emissions through strategic investments in data center energy efficiency, renewable energy, and carbon offsets. A well-executed greening plan can bolster an organization's public image, enhance employee satisfaction, and reduce the cost of operations. This guide aims to help organizations, particularly those with energy-intense data center operations, develop successful greening plans. It explores a wide range of green investment options that can reduce an organization's energy consumption-related environmental impact.

Readers will come to understand:

- Why some companies are criticized while others are commended for their data center efficiency and green energy investment campaigns.
- How investing in data center energy efficiency brings immediate, permanent reductions in greenhouse gas emissions, energy costs, and exposure to power market volatility.
- The significance of the Power Usage Effectiveness (PUE) and Carbon Usage Effectiveness (CUE) metrics and how to calculate them for a data center.
- The pros and cons of pursuing direct carbon emission reductions through efficiency investments versus pursuing indirect carbon emission reductions through purchases of environmental commodities.
- The value of using monitoring equipment, such as data loggers, as well as computer models to assess energy efficiency opportunities in a data center.
- The cascading benefits of investing in demand-side data center efficiency solutions.
- How investing in newer processing technology can offer substantial efficiency improvements.
- How server virtualization minimizes energy losses associated with powering and cooling idling servers.
- What exactly the “cloud” is, and the environmental advantages of outsourcing server operations to a network-based cloud computing service.

- The types of cogeneration and fuel cell generation systems, their pros and cons, and how they can advance an organization's energy efficiency and environmental goals.
- The types of data center cooling systems (including free cooling) and methods of airflow management that maximize data center energy efficiency.
- The range of renewable energy investment options (including on-site generation) and the advantages and disadvantages of those options.
- Key cost, performance, and integration concepts involved in assessing the value of investing in on-site generation, particularly on-site solar PV generation.
- How the extent of environmental benefits provided by energy efficiency and green energy investments can vary substantially by region.
- How to distinguish between and benefit from investments in environmental commodities including voluntary renewable energy certificates (RECs), white tags, and carbon offsets
- The difference between, and pros and cons of investing in bundled RECs (through a green power program), unbundled RECs, and offsets sourced from renewable energy projects.
- The relative effective cost of Scope 2 emission reductions sourced from bundled RECs, unbundled RECs, carbon offsets, on-site fuel cell generation, and on-site solar PV generation.
- Best strategies to communicate green investments for maximum credibility.

Who Will Benefit from This Guide:

If you need to quickly make sense of the many available data center energy efficiency, renewable energy, and carbon offset investment options, then this report is for you. We have aggregated key insights from hundreds of resources and conducted independent analyses to provide a straightforward guide that will help you develop an integrated greening and communications strategy.

About the Authors

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Companies and organizations named in this report include:

Facebook, Greenpeace, Uptime Institute, ICF International, The Green Grid, U.S. Environmental Protection Agency, Digital Realty Trust, U.S. Department of Energy, Lawrence Berkeley National Laboratory, Onset Computer, Schneider Electric, Power Assure, Intel, AMD, Oracle, IBM, HP, Cisco, VMWare, CA Technologies, Citrix, Dell, Microsoft, Symantec, IDC, National Institute of Standards and Technology (NIST), Accenture, WSP Environment & Energy, Google, Amazon, Salesforce.com, Sun Microsystems, Syracuse University, Qualcomm, Database of State Incentives for Renewable and Efficiency (DSIRE), OpenEnergyInfo, Neuwing Energy Ventures, Nexant, Sterling Planet, FuelCell Energy, UTC Power, Bloom Energy, Lazard Ltd., Connecticut Department of Public Utility Control, American College Testing, American Council for an Energy Efficient Economy (ACEEE), U.S. Green Building Council, eBay, 42U, Cadmus, Raritan, Emerson Network Power, AccelOps, Wright Line, Skanska, Lee Technologies, Cummins, Caterpillar, GE, Ameresco, National Renewable Energy Laboratory (NREL), National Energy Regulatory Commission (NERC), Federal Trade Commission (FTC), Green-e, Center for Resource Solutions, SolarBuzz, SunPower, FirstSolar, Sharp, Kyocera Solar, Suntech Power, Yingli Green Energy, Enphase Energy, SMA America, Fronius USA, Wesco Distribution, California Solar Center, Electricity Storage Association, BendBroadband Vault, Sonoma Mountain Data Center, Federal Energy Regulatory Commission (FERC), Nike, European Union Emissions Trading System (EU ETS), Regional Greenhouse Gas Initiative (RGGI), Yahoo!, World Resources Institute (WRI), Chicago Climate Exchange, Ecosystem Marketplace and Bloomberg New Energy Finance, Stockholm Environment Institute, The World Bank, The Carbon Neutral Company, Carbon Disclosure Project, Haworth

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