DIGITAL REALTY

WHITE PAPER

Green Data Centers are Imperative for Enterprise Success

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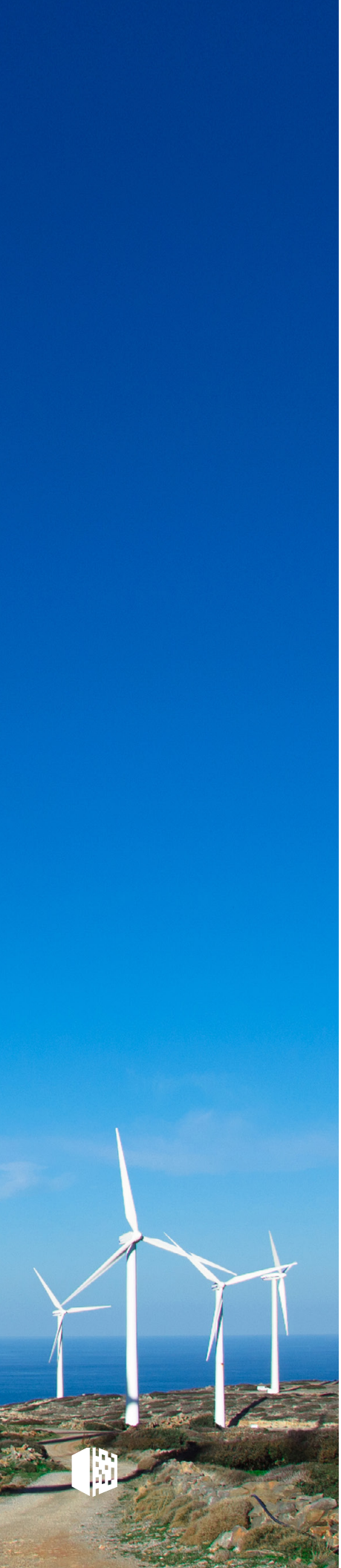

Summary

From the world's largest companies to smaller enterprises, sustainable practices and environmental stewardship are becoming core to enterprise business strategy. In fact, sustainability—once seen as a forward-thinking competitive advantage—has evolved into a necessity in the global economy.

With the rapid growth of the digital economy, the demand on the data centers literally powering it is growing in lock step. When taken as a class of building, data centers are among the highest consumers of power. It's more critical than ever for enterprises to seek alternative energy solutions for their data center infrastructure.

Taking a Powerful Leap

So how can your organization move towards more sustainable practices? While there are many ways to reduce carbon footprint and energy usage, one of the most impactful strategies is to source renewable energy in your data centers.

Read this white paper for a deep look at clean energy, how to acquire it and what to look for in your data center strategy.

Rising Power Demands

Ever-advancing technology is enabling the increase of data creation, consumption and storage. With these increases, a domino effect occurs.

AVAILABILITY OF NEW TECHNOLOGY

Increase in Data Creation

Increase in Data Consumption	**Increase in Technology**
Increase in Data Storage	**Overall Increasing Footprint**
Increase in Data Analysis	**Overall Increase in Power Consumption**

This increase in data creation is driven by the rapid growth of the data we create and store every day. IDC forecasts that global data will grow to an astounding 163 zettabytes by 2025[1], which is equivalent to watching the entire Netflix catalog 489 million times.

While efforts to improve the energy efficiency of data centers—such as cooling system upgrades, expanding the operating parameters of data halls, and optimizing air flow by using smart sensors and controls—will remain an important area of focus, organizations are also capturing significant sustainability gains by switching to clean energy.

As more and more data is captured, computed, and stored, companies are looking for ways to offset the growing environmental impact of their data centers. Many are constructing green-certified data centers, but the biggest impact comes from sourcing renewable energy to power these high energy use facilities. A number of leading global companies are also becoming more vocal in demanding that their data center providers source renewable energy for their data center energy use.

[1] U.S. Global Change Research Program, "Fourth National Climate Assessment". https://nca2018.globalchange.gov/ [Online Resource]

Powering Your Business With Renewable Energy

Since data may seem abstract and formless, it might be strange to think of it as having a carbon footprint. But data has a physical form since it lives in physical buildings such as data centers. Data centers are among the highest consumers of power. In the U.S. alone, data centers consume more than 70 billion kilowatt-hours of electricity a year which is equivalent to approximately 2% of all electricity use in the U.S.[2] So moving towards sustainably operating your data center can make a much needed, positive impact on the environment.

What Is Renewable Energy?

Renewable energy is derived from sources such as the sun (solar), wind, the movement of water (hydroelectricity), biofuels (fuel derived from organic matter), and geothermal activity. In other words, renewable energy comes from sources that are not depleted when used and do not emit carbon emissions which are harmful to the Earth's atmosphere.

The "brown" alternative is energy derived from fossil fuels that emit carbon, such as natural gas, coal, and oil. In the gray area are technologies like nuclear power, which is typically considered "zero carbon" but not renewable and can carry additional environmental concerns related to the disposal of radioactive waste.

Renewable energy sources are in higher demand than their brown and gray alternatives and are becoming more affordable. Additionally, advances in technology are increasing their availability for purchase. The International Energy Agency (IEA) reports "renewables capture two-thirds of global investment in power plants to 2040 as they become, for many countries, the least-cost source of new generation."[3]

[2] https://betterbuildingsinitiative.energy.gov/challenge/sector/data-centers
[3] https://www.iea.org/weo2017

3 How Renewable Energy in the Data Center Helps Your Enterprise

Good For the Planet and Good For Business

Implementing green practices in your data center not only benefits the planet but is also good for business. According to AFCOM's 2018 State of the Data Center Industry report, approximately 42% of respondents have or are planning to deploy a renewable energy over the next year. And 60% of those respondents indicated that this new renewable energy source will help them lower overall TCO of their data center while helping them achieve green initiatives.[4] Using fewer non-renewable resources means reducing overall utility costs.

Lower Costs While Maintaining Consistent Performance

Reducing energy usage doesn't have to mean compromising power efficiency. In fact, renewable energy is now seen as a reliable source of power which can help keep Power Usage Efficiency (PUEs) low. A lower PUE means that power is being used more efficiently which ultimately translates to lower operating costs for you. As of 2018, Google touts an average PUE of 1.12 across all their data centers running on 100% renewable energy. For reference, a PUE of 1 is considered perfect.

Improve Brand Image and Customer Loyalty

Consumers are becoming more and more aware and interested in social and environmental issues. They see a company's values as equally important to its responsible business practices.[5] In the U.S., 80% of consumers care about the use of renewable energy according to a survey conducted by the National Renewable Energy Laboratory (NREL).[6] Sustainability is no longer seen as a nice-to-have initiative. Rather, it's becoming a necessary corporate pillar for thriving in the competitive landscape and gaining consumers' trust and loyalty. According to Deloitte, "energy management has become table stakes for competitiveness."[7]

[4] https://www.datacenterknowledge.com/afcom/state-data-center-industry-2018-where-we-are-and-what-expect

[5] http://www.conecomm.com/2017-cone-communications-csr-study-pdf

[6] https://www.nrel.gov/docs/fy11osti/50988.pdf

[7] (2017) Deloitte Resources 2017 Study. https://www2.deloitte.com/content/dam/Deloitte/us/Documents/energy-resources/us-deloitte-resources-2017-study-energy-management.pdf

Green Innovations in the Data Center

One startling prediction for the future of ICT's (Information and Communications Technology) energy consumption is that data center electricity use will significantly increase by 2030 to 8% of the projected global demand.[8] However, others believe that with the adoption of more energy efficiency measures, energy consumption may only grow to 3%.[9]

The Rise of Hyperscale

Over the past decade, there has been more of a shift towards hyperscale computing. Hyperscale data centers allow businesses to store and process massive amounts of data and can be more energy efficient.[10] They are able to accommodate and easily scale up to thousands of servers while taking a more bare-bones approach to design. Stripping away unnecessary functions that use up energy, such as certain lighting and cooling equipment, help to lower PUEs. A 25% drop in energy usage is estimated if 80% of servers were transferred to hyperscale data centers. Leading companies like Google, Amazon, and Facebook were early adopters of hyperscale and are fueling its growth.

AI and ML in the Data Center

Artificial intelligence (AI) and Machine Learning (ML) have been proven to enhance energy efficiency in the data center. In 2016, Google implemented an AI and ML system to manage the cooling of its data centers and saw energy savings of up to 40%.[11] The AI system was able to adapt and to manage the cooling of its data centers, power, and pump speeds and then predict future temperatures and pressures over time. This helped prevent overutilizing unnecessary energy by learning from past patterns.

[8] https://www.mdpi.com/2078-1547/6/1/117

[9] International Energy Agency. Digitalization and Energy (IEA, 2017). https://www.iea.org/publications/freepublications/publication/DigitalizationandEnergy3.pdf

[10] Shehabi, A. et al. United States Data Center Energy Usage Report (LBNL, 2016); available at https://go.nature.com/ejg7sr

[11] (2016, July 20). DeepMind AI reduces Google Data Centre Cooling Bill by 40%. Retrieved from: https://deepmind.com/blog/deepmind-ai-reduces-google-data-centre-cooling-bill-40/

4 Ways to Source Clean Energy

Whether you run your own data center, or work with a partner, there are four key ways for enterprises to source clean energy.

1. Purchase green

The first and often simplest approach is to simply select the "green power" option from your local utility company, when such a program is offered. Utilities meet clean energy obligations by purchasing power from clean energy projects and then purchasing renewable energy certificates on their customers' behalf. Utilities charge a premium price for this clean energy product, often between $0.01 and $0.03 per kilowatt-hour, which contributes to the perception that clean energy is more expensive than their standard fuel mix, which typically consists primarily of "brown" power sources.

2. Purchase certificates

An alternative pursued by many businesses is to purchase renewable energy certificates (referred to as RECs) primarily from third-party aggregators.

While not a direct carbon offset, RECs can help reduce indirect emissions from electricity use. Each REC represents one megawatt-hour of energy generated from renewable sources.

Aggregators procure RECs from renewable power plants on behalf of their clients. This approach provides flexibility to specify the type of renewable energy, as well as to purchase RECs for facilities that do not have local utility green power options. Prices vary but are typically a fraction of the cost of utility green power programs.

Organizations can buy third-party-verified and tracked RECs, knowing that the money will ultimately work its way back to those power plants that feed in energy from clean energy sources. A criticism of this approach is its low "additionality," a measure of how impactful the effort is to add new renewable energy capacity and displace fossil fuels.

3. Buy direct

A third route to procure clean energy is to purchase renewable energy directly from a power plant developer. This is increasingly the path pursued by technology companies such as Apple, Google, Facebook, Microsoft, and others. These power purchase contracts commit the buyer to purchasing the power and RECs produced by a wind farm, solar installation, or other renewable project at a fixed price, typically for a period of 10 to 25 years.

These contracts, referred to as power purchase agreements (PPAs), provide direct "line of sight" from the energy purchaser to the clean energy producer. These transactions often are for 20 to 100 megawatts or more of power capacity. Smaller organizations may not use sufficient energy to warrant an arrangement of this size but there may be sources available to meet their needs too, including packages that aggregate demand for smaller blocks of energy across multiple buyers, and community solar share programs.[12] These contracts also provide the developer with an incentive to develop new projects to meet the demand.

Additionally, virtual PPAs (VPPAs) are becoming more prominent. VPPAs are long-term financial agreements that are structured typically for 10-20 years. They "contract for differences between the fixed renewable prices and a wholesale price settled on the grid at either the hub or the node."[13]

4. DIY

The fourth route is the most direct: do it yourself. Some companies opt to build and operate renewable power solutions by installing solar panels, wind turbines, or biogas-powered fuel cells at or near their data center. Companies that take this on-site approach are also often sourcing clean energy from some or all of the other options already presented.

Building renewable generation on-site is a less common tactic because the clean energy capable of being produced on-site tends to account for only a small portion of the data center's total energy need.

An increasing number of businesses are using one or more of the four approaches outlined in this paper to supply their data centers with renewable energy. Each approach has a mix of advantages and shortcomings for a given company, but with a careful study of the available options many businesses are finding that powering their data center with clean energy is more feasible than they had previously thought.

[12] Silverstein, Ken. (2017, January 10). Smaller Businesses Want Renewable Energy Developers to Spread The Green. https://www.forbes.com/sites/kensilverstein/2017/01/10/smaller-businesses-want-renewable-energy-developers-to-spread-the-green/#302ebf5c6362

[13] Mattson-Teig, Beth. (2018, July 7). Increasing Renewable Energy in Real Estate. https://www.reit.com/news/reit-magazine/july-august-2018/increasing-renewable-energy-real-estate

What to Look for in a Sustainable Data Center Provider

Fortunately, there are many programs that are in place to promote the collective sustainability effort. Here is a partial list of these programs that you should look for when choosing a sustainable data center provider.

ENERGY STAR Certification

ENERGY STAR is a joint Environmental Protection Agency (EPA) and Department of Energy program. It is a voluntary program that helps to identify and promote energy efficiency in products, homes and buildings. Look for the Energy Start Certification or Energy Stat Certified label.[14]

Green Power Partnership

The Green Power Partnership is a voluntary EPA program designed to increase the use of renewable electricity in the United States and use "green power as a way to reduce the environmental impacts associated with conventional electricity use. Partners commit to use green power for all, or a portion, of their annual electricity consumption."

Green Certifications

LEED, or Leadership in Energy and Environmental Design, is a certification program for buildings and communities that guides their design, construction, operations and maintenance toward sustainability. It is operated by the U.S. Green Building Council.[15]

Also look for green certifications such as BREEAM, Green Globes, BCA Green Mark and CEEDA.

[14] https://www.energystar.gov/about/join-energy-star

[15] https://www.epa.gov/greenpower/green-power-partnership-program-overview

The Better Buildings Challenge

The Better Buildings Challenge represents the joint effort of hundreds of public and private sector organizations to develop and share strategies addressing the energy consumption dilemma. Participating government agencies are targeting a cumulative 40% reduction in greenhouse gas emissions by 2025. More than 300 private sector participants have enrolled 4.2 billion square feet of building space in the program.[16]

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EXPLORE our green data center portfolio.
LEARN MORE about our sustainability program.

[16] https://betterbuildingssolutioncenter.energy.gov/better-buildings-initiative-2016-infographic

Digital Realty's Sustainability Commitment

Digital Realty is the leading global provider of data center solutions with a portfolio of more than 195 facilities across four continents. Digital Realty has 274MW of solar and wind capacity under contracts, part of which offsets 100% of its U.S. colocation and interconnection energy usage, reducing our carbon footprint by more than 275,000 metric tons per year. The environmental benefits from Digital Realty's renewable energy sourcing efforts will have an impact comparable to meeting the energy needs of 55,000 U.S. homes per year.

We are deeply committed to building and operating green, energy-efficient data centers that enable your organization's sustainable initiatives and ultimately help our planet.

About

Digital Realty supports the data center, colocation and interconnection strategies of more than 2,300 firms across its secure, network-rich portfolio of data centers located throughout North America, Europe, Asia and Australia. Digital Realty's clients include domestic and international companies of all sizes, ranging from cloud and information technology services, communications and social networking to financial services, manufacturing, energy, healthcare and consumer products.

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