The data center's role in building a sustainable future

Promoting resource efficiencies and cost savings through procurement practices, advocacy and innovation

Executive overview

The connected, always-on world we live in relies on data centers to operate, grow and succeed. As the internet and our need for connectivity continue to expand, so will the data center market. Already rivalling the airline industry in carbon emissions, the data center industry has an escalating responsibility to implement forward-looking initiatives that conserve energy and water, and minimize waste. The volume of energy the industry uses positions it to be a leader in promoting renewable energy and a series of resource efficiencies that can lessen the industry's environmental impact. As key enterprises step up to promote sustainability, data centers can—and should—join their voices to pave a path for environmentally focused efficiencies. Data centers without a future-looking sustainability strategy have may have a lot to lose.

The drive toward a sustainable world

For the average person, sustainability practices encompass recycling paper and plastic, conserving water, and embracing electric or hybrid vehicles and other eco-friendly habits. For the data center industry, which is responsible for 3% of global power consumption, sustainability takes on a more intense and innovative path. Based on the sheer size and scope of its business, data centers—like enterprises—have an obligation to implement and promote more sustainable choices and solutions.

> "**Sustainability:** Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."
>
> UCLA

The recent COVID-19 quarantine has clearly demonstrated the positive impact decreased emissions can have on the environment. As businesses shut down and people remained at home, notoriously smog-filled skylines across the globe cleared, and the internet filled with before and after photos. Scientists also took note with some studies reporting up to a 70% decline in pollution over the U.S., northern China and Western Europe as compared to the same timeframe in 2019. NASA satellite data also reported environmental improvements with an average 30% decline in air pollution across northeast U.S. cities in March 2020 as compared to March rates between 2015 and 2019.

This widespread disruption in regular business and personal practices demonstrates the benefits of sustainable practices.

The good news is that many businesses, including corporate giants such as Microsoft, Facebook and Salesforce, are establishing sustainability strategies to support the planet. Microsoft released an aggressive plan to halve its carbon emissions by 2030. To help

achieve this goal, the company is incentivizing its suppliers and partners to reduce their own carbon footprints in order to continue doing business with it.

As a massive consumer of resources, the data center industry must follow suit and make changes within its facilities and its communities to conserve resources and protect the environment.

The data center's impact on the environment

As an epicenter of connectivity, data centers provide a location for organization to house their equipment and connect with the providers, partners and customers required to run their businesses. This utilizes a lot of power and other resources, and creates a lot of waste. The U.S. Department of Energy estimates that a single large data center may require more than 100 megawatts of power capacity—that is enough to power 80,000 U.S. households. With more than 500 hyperscale data centers in the world, that is a lot of energy.

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U.S. Department of Energy

As their roles in our digital, connected world become increasingly critical, data centers will continue to grow, and, in turn, consume more resources and generate more emissions. This is a staggering thought when you consider the data center industry is currently responsible for 2% of greenhouse gas emissions—a number that is on par with the airline industry.

Because of this, data centers are poised to be powerful voices for change, and can play a central role in lessening the impact on the environment. These organizations need to make a public commitment to minimize their environmental footprints, invest in renewable energy, and devise long-term plans to continually improve their sustainable efforts. They need to be cognizant and strategic in how they run their facilities, from what and how they purchase their energy to how they cool the data center, and everything in between.

Devising a comprehensive sustainability plan

To truly adopt and execute an environmentally sustainable strategy, data centers must address the three environmental pillars of sustainability: power, water and waste.

ADDRESSING POWER CONSUMPTION

Data centers house an enormous number of servers and other equipment, all of which use power. These devices also give off a tremendous amount of heat which needs to be cooled. According to some estimates, the energy used to cool the facility represents 30% to 50% of total data center power consumption.

Data centers need to devise strategies to minimize their power consumption and find more environmentally conscious ways to do business. There are multiple ways to do this.

Data centers are responsible for **3% of global power consumption**—that is more power than the United Kingdom.

Invest in clean energy. Utilizing green energy sources, such as wind and solar power, is one way for a data center to reduce its carbon footprint. These clean energy sources utilize no power and can be cheaper than traditional carbon-emitting energy sources.

Adopt efficient building designs. Data centers can also adhere to efficient building design standards such as Leadership in Energy and Environmental Design (LEED). LEED, the global leader in green building certifications, provides a framework for highly efficient and cost-saving buildings. Adopting an ENERGY STAR program and installing blanking panels, motions sensors, LED lighting and other energy-efficient solutions can also help reduce power consumption.

Employ continuous PUE monitoring. Power usage effectiveness (PUE) is a key metric to help measure the energy efficiency of a facility. Organizations strive for numbers as close as possible to 1.0, which denotes 100% efficiency. The Uptime Institute reported that in 2019 the average U.S. data center PUE was 1.67. While most modern data centers are built to meet low PUE efficiency standards, legacy data centers can improve their PUEs by implementing energy-efficient initiatives.

MINIMIZING WATER CONSUMPTION

Not only does a data center use a lot of power, it also uses a lot of water—to the tune of 360,000 gallons a day. The bulk of this water is used to regulate the temperature of the data center, removing the heat generated by the equipment within the facility. Without a sufficiently cooled environment, equipment can overheat resulting in downtime and lost productivity—a huge cost for any business. However, several initiatives to conserve water and maintain the temperature of the data center have emerged.

Data centers use approximately **360,000 gallons of water per day**—enough to fill half an Olympic-sized pool.

Collect rainwater. A rainwater harvesting system can salvage millions of gallons annually. This water can be reused to operate cooling systems without tapping new water supplies.

Procure renewable energy. Sourcing energy from photovoltaic solar panels and wind turbines can also help conserve water. Unlike power plants, these energy sources do not use water to create energy.

Track WUE. Like power use, water use can be measured according to a water use effectiveness (WUE) ratio. This provides data centers with a concrete assessment of their water conservation practices.

RECYCLING WASTE

For the data center, waste reaches beyond traditional trash and recycling to include e-waste, which is discarded electrical or electronic devices. According to United Nations University, 44.7 million metric tons of e-waste was generated globally in 2016—and only 20% of this was recycled.

By the nature of their business, colocation data centers do not own most the of the equipment within their facilities, and the equipment they do own—such as generators, UPS and life safety equipment—have long life spans, made even longer by regular maintenance and a temperature-controlled environment. Additionally, data centers frequently repurpose aging equipment into less critical roles. That being said, data centers can follow some basic guidelines to minimize e-waste.

Implement e-waste management programs. This starts by continuing to focus on recycling electronic and electrical equipment before sending it to a landfill. Data centers can also partner with organizations that prioritize this mission to help customers repurpose equipment or arrange for proper disposal. A data center provider with an IT asset disposal (ITAD) program is a great start.

Office recycling programs. Data centers should also implement recycling programs within their offices and workspaces. This can include placing recycling bins in work areas, using recycled materials, encouraging reusable cups and more.

Accountability keeps sustainability efforts moving forward

To ensure the efficacy of their sustainability efforts, data centers should devise a series of concrete, measurable goals that are assessed regularly, and reported annually. Businesses across industries are publicizing their green initiatives by reporting their efforts, and their progress toward their goals, to a variety of third-party benchmarking and assessment agencies.

As data centers report on their metric, it is important to gauge the efforts of their partners and vendors as well. Environmentally conscious organizations like Facebook take this corporate alignment seriously, evaluating potential partners according to their own commitments to sustainability. This use of resources is addressed and reported on according to three categories:

Scope 1 refers to the carbon emissions, water use or waste that are discharged by the equipment running within the facility or is directly used by the facility. For example, the carbon emitted by an onsite diesel generator or the water used to cool the environment would fall into this category.

Scope 2 includes the carbon emissions, water or waste that are generated from the production of resources purchased by the data center from a utility provider. While the resources are not being emitted or used by the data center directly, they are being consumed to create resources for the data center.

Scope 3 includes the carbon emissions, water or waste produced by the data center's larger supply chain, including the trucks that deliver their products or the manufacturer that produces the product.

While Scope 3 resources can be hard to measure, data centers should, at minimum, track and report on their Scope 1 and Scope 2 metrics. By garnering this information, data centers can hold themselves and their resource suppliers accountable for their practices and work toward continually improving their sustainability efforts and overall position.

QTS: Delivering a more efficient, cost-effective and sustainable future

QTS, a leading provider of software-defined and mega scale data center solutions, understands the importance of sustainable practices, and implements a series of environmentally focused initiatives across its fleet of data centers. Spanning more than six million gross square feet of data center space in North America—with additional square footage in the Netherlands—QTS uses 2.7 million kilowatt hours (kWh) of power per day. QTS feels the weight of this and is committed to enacting and promoting sustainability best practices within the industry and beyond.

QTS uses **2.7 million kWh** of power per day—more than the country of Belize and enough to power 91,000 homes.

"In our technological world, we have an obligation to minimize our carbon footprint and conserve our resources," said Travis Wright, vice president, energy and sustainability at QTS Data Centers. "For QTS, how we deliver our services is just as important as what we deliver. We want to have a positive impact on the planet and continue to meet our customer's expectations."

CONTINUALLY EVOLVING GOALS SET THE PACE

To solidify its commitment to sustainability, QTS set a series of measurable sustainability goals in 2017. These expanding initiatives are fully supported and encouraged by the QTS board and executive team.

"When I talk to my peers in the sustainability world about our biggest challenges, a lack of top-level

management support is the consistent issue," said Wright. "*Many executives view sustainability as a cost with no payback. This makes it difficult to get the support to roll out sustainability programs.*"

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Sustainability is not only driven by the executive leadership team at QTS, it is also engrained in its corporate culture and an integral part of its Vision 2025 plan, which details the organization's future-looking initiatives. This support enables QTS' sustainability team to integrate green initiatives and sustainability practices into its operations.

Within its first year, QTS accomplished four of its six goals, allowing the organization to push itself further to undertake more aggressive goals. Today, these goals include:

Procure 100% of its power from renewable energy sources by 2025

QTS actively pursues options that minimize its carbon footprint by utilizing renewable resources and energy to fuel its operations. Between 2017 and 2019, QTS has purchased 465 million kWh of green power—enough to power 42,000 homes for a year. At the end of 2019, the organization procured 32% of its energy from renewable sources. In 2020, its Irving, Fort Worth, Hillsboro, Chicago, Piscataway, and two Netherland sites all operate on renewable power. This effort allows the company to continue to reduce its carbon footprint even as the business grows.

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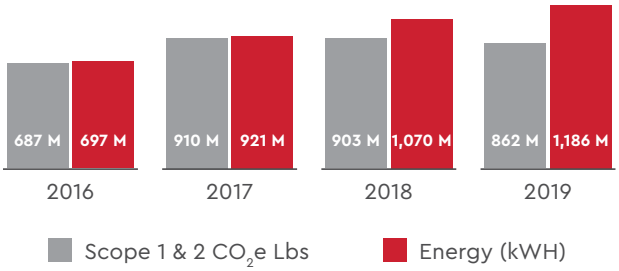
CO_2e Emissions vs **Energy Consumed**

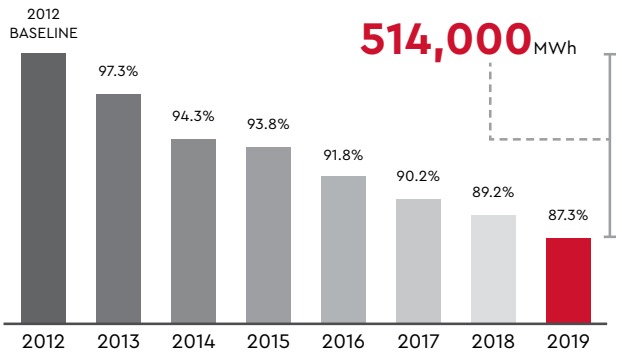


To achieve an economy of scale that promotes cost-efficacy in its renewable energy purchases, QTS partners with a large financial organization to execute long-term renewable contracts with offsite energy suppliers. QTS purchases the requisite amount of energy and the energy supplier issues renewable energy credits (REC) that enable QTS to buy power off the Grid to offset the difference between market rate and the contracted rate. This is known as a contract for differences, and ensures that the power QTS uses from the Grid is offset with the renewable energy assigned to the data center.

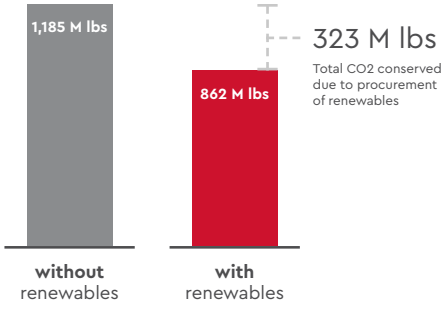
This program—as well as a series of other energy-saving solutions, including installing blanking panels, hot aisle/cold aisle airflow management systems, highly efficient pumped refrigerant systems, water and airside economizers, free cooling, variable frequency drives, automated lighting controls and ENERGY STAR equipment—reduced the company's PUE by 2%, while the average global data center PUE rose by 6%. To continually improve this metric, QTS provides continuous PUE monitoring at many of its data centers.

QTS has nearly doubled its renewable energy procurement year-over-year.

Power Usage Effectiveness



2019 C0² Emissions



QTS utilized **324,397,000 kWh** of green power in 2019—enough to power the Dallas Cowboys' football stadium for 13 years.

Pursue Green Building Certifications in 90% of its facilities by 2025

By the end of 2019, 55% of QTS' facilities were LEED certified. QTS also utilizes UL and CE listed equipment that meets or exceeds common energy efficiency standards, and is also exploring additional green building certifications and technologies, including hardware-in-the-loop (HIL) technology.

Conserve at least 15 million gallons of water per year

In 2017, QTS challenged itself to conserve at least 10 million gallons of water per year. After achieving that goal in 2018 and 2019, the organization increased the goal to 15 million gallons of water per year. Since beginning this program, QTS has recycled 103,260,779 gallons of water—equal to 103 Olympic-sized pools.

To achieve this milestone, QTS has established a number of water conservation programs. For starters, its Atlanta-Metro and Piscataway facilities utilize rain harvesting systems that employ a combined seven acres of rooftop space to collect more than 9 million gallons of water, which the data center provider reintegrates into the facilities' cooling systems. Its Fort Worth and Santa Clara facilities utilize recycled water, and have recycled 99,005,309 gallons since 2015.

As of 2019, QTS has recycled **103,260,779 gallons** of water—equal to 103 Olympic-sized pools.

QTS has also developed the Water FREEdom design which utilizes highly efficient dry cooling systems with airside economization paired with solar and wind power. Employed in its Hillsboro and Chicago data centers, this water-free cooling solution approaches the efficiency of a water-based system in most climates, and will be used in all new QTS data center builds.

QTS sources 100% of the renewable energy from solar and wind assets that use nearly no water. These water conservation efforts are key differentiators in the data center market and have helped QTS improve its overall water use efficiency by 2% in 2019.

Install EV charging stations at 75% of QTS facilities by 2025

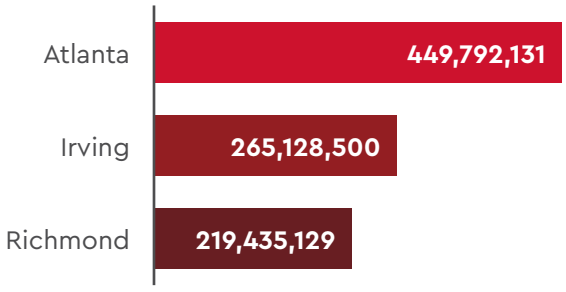
In 2017, QTS committed to installing electric vehicle (EV) changing station within 30% of its facilities. Within the first two years, the organization exceeded this goal, and upped its commitment to 75%. As an added benefit to employees, customers and site visitors, QTS provides the first three hours of charging at no cost.

Recycle 90% of operational waste by 2025

Initially, QTS committed to recycling 600 million pounds of material by 2025. When the organization reached that goal in 2019, it adjusted its goal to recycle 90% of its operational waste by 2025.

The bulk of this recycled material is attributed to its Brownfield redevelopment projects, which convert under-utilized, properties into energy-efficient, state-of-the-art facilities. While most data center providers would raze these buildings and rebuild them from the ground up, QTS refreshes these structures, reusing the existing building materials. This approach diverts the material from landfills, eliminates the emissions from trucks hauling scrap to the landfill and saves the energy needed to create new materials. QTS has currently completed four Brownfield redevelopment projects: Atlanta, Chicago, Irving and Richmond, diverting more than 500,000 tons of material from landfills and recycling 1,293,914,720 pounds of data center weight.

Pounds in Building Recycling



"These buildings don't come on the market frequently, but when we find one with the right amount of space in the right location, we like to use them," explained Wright. *"We've been able to take blighted buildings and transform them into cutting-edge facilities. This not only benefits the environment, it also helps the local community by decreasing crime rates and improving the economy. This program is a key differentiator for us."*

QTS also employs a robust office recycling program with desk-side recycling and procurement policies that prioritize recyclable and reusable materials by eliminating disposable cups, plates, straws and utensils, and purchasing coffee in bulk. The data center provider also utilizes modular data center physical infrastructure (DCPI) that eliminates waste in manufacturing and performs more efficiently than built-in-place systems.

QTS is also addressing e-waste by repurposing aging assets into less critical roles, and implementing an ITAD program to help its customers—and itself—properly dispose of end-of-life equipment. To gauge its success in its recycling efforts, QTS measures its material usage effectiveness (MUE). The company experienced a 15% increase in its overall recycling rate to reaching the 80% milestone in 2019. This helped dropped its MUE from 1.35 to 1.25.

QTS has recycled or reused over **1.2 billion pounds** of material.

LEADING BY EXAMPLE

To make an on-going and positive impact on the environment, QTS has made a commitment to be a strong voice for sustainability in the industry, its community and the world. This commitment is rooted in corporate and community partnerships that support green policy changes and innovative strategies.

"We can do a little bit of good by getting our own house in order. We can do a lot of good by helping

others get there by changing legislation," said Wright. *"We've done some testifying against regulated utilities that are trying to squash renewables. Making that path easier for everyone– whether its industrial, commercial, residential or our even for our competitors— that's what we're here for."*

Partnering for change

QTS continues to partner with like-minded organizations to help drive sustainable practices.

RE100. In 2019, QTS joined RE100, a global corporate leadership initiative of businesses committed to 100% renewable electricity. As a member, QTS strives to bring about global changes that support zero carbon grids.

Renewable Energy Buyers Alliance (REBA). QTS is a member of REBA, an alliance of large clean energy buyers, energy providers and service providers. Committed to making renewable energy procurement more accessible to all organizations, REBA takes an active role in lobbying for more sustainable practices and legislation. The organization also advocates for more cost-effective pricing on renewables across the U.S. QTS sits on the policy board of this organization, alongside corporate powerhouses like Microsoft, Target, Walmart and Google.

Data Center Coalition. QTS also sits on the Energy committee of the Data Center Coalition, which primarily focuses on energy and pricing, as well as access to renewables.

A strong, active voice in the industry

QTS is also a vocal leader in promoting renewable energy and conservation. When Dominion Energy in Virginia planned to build fossil-fueled power plants to support the rising electricity consumption of local data centers, QTS joined forces with other large technology companies to demand this power supply be delivered via renewable energy options that utilize cleaner and more cost-effective technology.

QTS also speaks at and hosts sustainability-focused conferences, sharing best practices and coaching peers on how to minimize their environmental footprints. This includes its strategy for procuring renewables at a lower cost than conventional energy. Its Irving, Texas facility hosted Engie's Energy Exchange, which brought together organizations from across the country to share sustainability best practices and help drive progress toward low-carbon objectives. The data center provider also hosted EUCI's Utilities Conference in its Richmond, Virginia site in January 2019, and was slated to host this event again in 2020.

PROMOTING TRANSPARENCY

Public reporting of sustainability efforts

To report on its green business practices and its progress towards its sustainability goals, QTS produces an annual Environmental, Social and Governance (ESG) Initiatives Report. This detailed report includes information on Scope 1 and Scope 2 emissions, energy, water and waste, and is shared with its leadership team and employees.

QTS also actively reports its sustainability efforts and metrics to an expanding list of voluntary disclosure frameworks including GRESB, CDP, ECOVadis, the EPA Green Power Partnership and RE100, with plans to add others in 2020. The organization is also included in several public data ratings agencies that use information compiled from public sources, but do not offer voluntary reporting, such as MSCI.

Innovation sets QTS apart

QTS' commitment to transparency reaches beyond sharing its green practices with ratings organizations. The company digitized the data center environment to provide customers with real-time insight into data center functionality and analytics via its Service Delivery Platform (SDP).

SDP provides real-time, on-demand insight into key sustainability metrics including power draw and energy mix.

Using SDP, customers can visualize their power usage and energy mix to assess their environmental impact. Data is calculated based on actual power consumption, allowing customers to use the sustainability application within SDP to generate reports and make informed decisions that reduce their environmental footprints and benchmark changes. QTS continues to enhance these capabilities by increasing the data points on energy and water consumption to display PUE, WUE, renewables and the existing carbon footprint, all in real-time, to enable more environmentally focused decisions.

AWARDS

Since committing to its sustainability goals, QTS has received a number of awards which serve as a testament to QTS' success.

- Ranked **#1** Global Data Center in Sustainability
- 12th in Tech and Telecom
- Global Sustainability Leadership
- Travis Wright awarded "World's Most Influential Climate Leaders"
- Ranked #1 Sustainable Data Center Company
- Honoring Sustainability, Environmental Achievement and Leadership

> "QTS has clearly established itself as the data center leader in sustainability with their vision, strategy and documented commitment to a cleaner, more sustainable world. QTS is an exemplary model for the industry to follow as we expand our focus on achieving environmental and sustainability goals going forward."
>
> João Marques Lima, Founder and Editor-in-Chief, Data Economy

HUMANITARIAN PARTNERSHIPS PROMOTE A HEALTHIER FUTURE

QTS goes above and beyond everyday sustainability practices to participate in some industry-first partnerships that make a difference in the world. These programs provide a larger impact in the global community, spanning beyond how QTS runs its day-to-day business.

Grow with QTS

QTS partners with American Forests, a world leader in restoring forests for over 140 years. For every 100 kilowatts (kW) a customer contracts, QTS plants one tree each month for the life of the contract, at no cost to the customer. This program is available to all new and existing customers based on their current contracts, and amounts to tens of thousands of trees each year. Currently, plantings are focused in the Sierra Nevada mountains to rebuild areas destroyed by wild fires. This creates a powerful impact on the area as each tree saves a quarter ton of carbon dioxide, with a large tree absorbing 40 to 50 pounds of carbon dioxide.

A 1 megawatt deal for three years, equals 10 planted trees every month for 36 months—or 360 trees.

Fill it Forward

Access to clean water remains a global challenge for as many as 844 million people. QTS has joined the Fill it Forward program to make giving clean water as easy as drinking it.

Using the Fill it Forward app on their smartphones in tandem with a Cupanion reusable water bottle or cup, QTS employees can track their environmental footprints, stay hydrated and give clean water with every reuse. For every cup scanned, Cupanion donates $0.02—which exceeds the true cost of a cup of clean water—to charitable partners who specialize in clean water initiatives.

World Vision Partnership

QTS has also teamed up with World Vision Partnership, a humanitarian aid, development and advocacy organization, to provide clean water and clean water sources to those in need in developing countries.

For every 100 kW of power contracted, QTS will provide three people in a developing country with clean water for the life of the contract. For any single contract of 12MW of power or more, QTS will fund the building of a sustained clean water source, such as a well or water point, in a developing country of the client's choice, providing long-term, sustainable clean water to an entire community.

As major consumers of our resources, data centers owe it to their communities, customers and partners to establish clear sustainability strategies that prioritize renewable energy and more efficient resource use. Data centers need to take a lead in not only rolling out these sustainability practices within their own businesses, but in driving renewable energy initiatives and legislation that supports a stronger environment for years to come.

"*Renewable energy and modern energy technologies are the future,*" said Wright. "*QTS is committed to establishing forward-thinking initiatives that benefit our planet for future generations, while ensuring economic feasibility.*"