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Green data: How these high-energy facilities are ticking the boxes in ESG

BY KALI PERSALL

When British mathematician and data science entrepreneur Clive Humby coined the phrase "data is the new oil" in 2006, he could have been lauded as something of a prognosticator, given the colossal scale at which development and demand for the data center market would evolve over the next decade and a half.

The market has grown to become one of the most attractive emerging investment sectors for infrastructure and real estate investors alike, yet questions persist about how facilities with such high energy needs can still tick the boxes when investors' portfolios are focused on environmental, social and governance (ESG) factors.

In 2006, the data center sector consumed an estimated 61 terawatt hours – or 1.5 percent of total U.S. electricity consumption – for a total electricity cost of about $4.5 billion, according to a data center report to Congress by the U.S. Environmental Protection Agency. The estimated level of electricity consumption for that year was more

than the electricity consumed by all of the nation's color televisions, and by comparison, more than double the electricity consumed by the nation's servers and data centers in 2000.

Fifteen years later, data centers now consume an estimated 200 terawatt hours of electricity – or nearly 1 percent of global electricity demand – contributing to 0.3 percent of all global carbon dioxide emissions, according to the International Energy Agency (IEA). The IEA expects demand for data and digital services to continue its exponential growth over the coming years, with global internet traffic to double by 2022 to 4.2 trillion gigabytes per year.

Michael Hochanadel, managing director and head of digital assets at Harrison Street, says the easiest way to conceptualize these trends is to reflect on an individual's engagement with the digital world through a smartphone.

"In 2006, I had a flip phone, a laptop, an email device, a digital camera and a digital video camera," says Hochanadel. "Each did their job reasonably well, but none were connected with each other, and each generally produced a modest amount of data that ended up being stored on a desktop computer and backed up to an external hard drive. In other words, all of these devices created a grand total of zero data center demand.

"Fast-forward to 2021, I now have a smartphone with functionality across each of these categories and many others. It has 10 times the resolution of the camera and video camera, 10 times the compute and storage of the laptop, and 10 times the bandwidth of the phone. All of these capabilities have opened up new opportunities, all of which rely heavily on data centers and digital connectivity infrastructure."

He adds, "The bottom line is, we are witnessing a fundamental paradigm shift predicated entirely on rapid growth in compute and connectivity capacity."

Widespread data center buildout raises questions about persisting negative implications, which have nagged experts for decades. Operationally, data centers consume large amounts of electricity and water to run the building, servers and cooling infrastructure. Among the top concerns are increased emissions and greenhouse gases, growing strain on the power grid, and high capital costs associated with the expansion of data center capacity and construction of new facilities. Experts are optimistic, however, about how the industry is adapting to these challenges.

"While much of the focus has been on energy consumption, it's also important to acknowledge the energy savings that are a result of the industry's focus on the issue," explains Hochanadel. "For example, it's estimated that these efforts have saved 620 billion kilowatt hours of electricity between 2010 and 2020, largely due to the rise of cloud computing and hyperscale data centers. In the last decade, the number of physical servers, compute instances and demand for data centers [have] grown significantly, whereas the actual electricity usage has grown but at a disproportionately lower rate."

Colocation providers get creative

In recent decades, colocation providers, operators and data center developers have become more innovative in making data centers more sustainable. At the equipment level, new waterless cooling technologies, such as heat sinks and liquid immersion cooling, have resulted in both electricity and water savings. On the energy-sourcing side, cloud providers and major operators are making carbon-free energy commitments and finding ways to match workloads with renewable energy. Others are building their facilities into the local environment itself.

Take Cavern Technologies, Kansas City's first colocation data center and the largest colocation provider in the area, as an example. The company's data center is located 125 feet beneath the Midwest prairie and is fortified by a natural limestone bunker that is three times stronger than concrete. The limestone environment protects it

from natural disasters, cuts HVAC and environmental expenses nearly in half, and retains a 68-degree consistent ambient temperature with controlled heat dispersion.

Hyperscale companies are also at the helm of this innovation. Alphabet Inc.'s Google, for instance, is planning to switch to carbon-free energy to power its entire global operations by 2030, and other cloud companies, such as Microsoft Corp. and Amazon.com Inc., have made similar commitments. For the past few years, Microsoft has been exploring new waters – literally. In September 2020, the tech giant reeled up a barnacle-covered data center that had hunkered 117 feet deep on Scotland's sea floor for two years. The experiment proved underwater data centers are not only feasible, but also logistically, environmentally and economically practical.

This reimagining of the traditional data center has made the sector increasingly attractive and accessible for investors with an ESG focus.

If you "green" it, they will come

Such innovation has given rise to "green" data centers, which rely on energy-efficient technologies for their operations. In 2020, the green data center market was valued at $53.19 billion and is expected to reach $181.91 billion by 2026, according to a report from *Mordor Intelligence.*

Cost barriers, however, remain one of the biggest obstacles to green data centers, which require a higher initial investment to build than traditional data centers. Another significant challenge for the global green push is the cost to transition older, legacy assets to energy-efficient engineering solutions.

Jeff Kanne, president and CEO of National Real Estate Advisors, says low-cost power, connectivity, and land are the three major resources needed to operate a successful data center. According to Kanne, one of the best ways to create a green data center is to build it in a location that already provides power from renewable-energy resources.

Kanne explains the ultimate goal for an operator is to achieve a power utilization effectiveness (PUE) ratio of 1:1, meaning all the power that goes into the computers is being used for computations rather than removing heat, for example. Tenants will compare data centers' PUE ratios because a higher PUE ratio means greater use of electricity and a higher total cost of operation.

"As significant energy consumers, those in the data center sector have embraced a greater responsibility than most to be good stewards of our resources while reducing our carbon output," said Kanne.

As far as he knows, no operators have been able to devote all energy to maintaining the computers, resulting in a PUE of 1:1; however, he believes strategic positioning in the portfolio can impact these ratios. National Real Estate Advisors' strategy, for example, incorporates selecting sites in which the operations can benefit from "free cooling days" or days when the relatively mild climate can help dissipate the heat produced.

"As operators continue to push for efficiency in building design and increase their consideration of location's impact on power usage, their presence in ESG-focused portfolios will increase," says Kanne.

Infrastructure or real estate?

As the data center market continues to expand, experts have come to debate whether these facilities, which began as traditional industrial tilt-up constructed shell buildings, should be classified as either real estate or infrastructure. This, in turn, begs the question of how investors should approach this market.

According to Carl Beardsley, a director in the capital markets group at JLL, data centers are the backbone for many of the everyday applications and technologies used in society, which is a case for this asset class to be considered more "infrastructure" than real estate.

"The data center investor pool has historically been limited versus other asset classes due to the complexities of these buildings," says Beardsley. "However, the resiliencies through the pandemic and positive REIT performance in 2020 [have] caused many investors to find ways to participate in this exciting growth."

National Real Estate Advisors, which invests in a variety of real estate assets as well as data centers, has identified a number of long-term benefits of operating an energy-efficient data center, such as interest from high-quality tenants, increased reliability and operating efficiency, and reduced risk of negative events from extreme weather conditions. Kanne notes the push has been led by tenant interest in low-cost, sustainable power options, which can reduce the overall carbon footprint for those tenants.

"Within the investable universe of data centers, there is a continuum between assets reflecting real estate and infrastructure characteristics," says Kanne. "Certain data centers, such as single-tenant powered shell facilities, operate much like traditional real estate assets. On the other end of the spectrum, carrier hotel facilities share many characteristics with infrastructure assets due to the level of operational intensity and the criticality of the underlying network connectivity."

In the same vein, Hochanadel says investing in the digital space requires an understanding of both real estate and infrastructure perspectives. When it comes to allocation, he says investors are looking for managers with significant data center expertise, operator relationships and track record, combined with a strong pedigree of managing real estate and infrastructure funds.

The data center market has come a long way since 2006, and although there is a lot of work to be done toward sustainability in the industry, there seems to be a resounding optimism among experts.

"The exciting part of our industry's sustainability story is that there has already been meaningful progress towards improving efficiency, and we're only still at the beginning of the journey," says Hochanadel.

Kali Persall is a reporter with **Institutional Real Estate, Inc.** and editor of *iREOC Connect.*

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