



LEADING THE WAY TO A DATA-DRIVEN



SUSTAINABLE FUTURE

A rapid shift to a low-carbon economy is the key to business survival

In 2021, sustainability has become a central part of corporate strategy for any business. It now is especially vital in sectors experiencing such recent rapid, compounded growth, like the data center industry. The pandemic gave a turbo boost to the need for new developments surrounding sustainability. This was especially evident in the data center industry with the phenomenal surge in data usage that's been seen worldwide since March 2020.

In an October 2020 Leading Edge Forum report, the then-Governor of the Bank of England, Mark Carney, said: "We are very likely to see a politically-led rapid economic rebalancing, leading to a globalized low-carbon economy, at some point in the near future. When a massive global economic shift occurs, it favors the organizations that have prepared—and the impacts of global climate change are expected to be significantly larger and much more permanent than the impacts of the pandemic."

The concept of sustainability has been fueling many forward-thinking businesses to develop new models. This is happening in almost every industry throughout the world. Those concepts have been abundant in the data center industry, whether looking at water waste, subsea cables, carbon emissions or being applied to staff retention/recruiting and community involvement.

It should not be surprising that sustainability is emerging as a key focus, given that according to the World Economic Forum, the top four global risks were all climate-related: 1) extreme weather climate action failure, 2) natural disasters, 3) biodiversity loss and 4) manmade environmental disasters. In recent years, the tech industry has also had to adapt to the growing threat to their operations posed by the California wildfires.

After wildfires and pandemics, the lesson has been learned across the world to implement plans for global risks, whether for a local business or an international enterprise. This should cover a plan for how to best support an organization's data. With the role data plays in the world these days, the need is even greater to mitigate any operational interruption due to a foreseeable global risk.



The Bearkat II Wind Energy Project in Glasscock County, Texas will provide more than 260,00 megawatt-hours of renewable energy annually, serving a portion of the power needs for Digital Realty's 13 data centers in the Greater Dallas region

Furthermore, data can play a role in helping to mitigate further climate damage. Data helps companies and countries alike to better understand their future, as it relates to global warming, as well as to develop climate-friendly legislation and opportunities for a greener planet, tomorrow. When it comes to creating a strategy for any type of organization's data, it has to include: capturing, connecting, analyzing and the contextualization of data. All of these components are needed in order to then create actionable information from the data to help an organization with better—and greener—decision making.

Increasingly, regulators and local authorities have started scrutinizing potential global risks, including the threat the carbon emissions from data centers pose to the environment. This has resulted in companies (both data center providers and their customers) taking steps to enhance sustainability programs and goals, some for the first time and some going further by enhancing the efficiency of what's currently in place. This all explains just why sustainability has become, and will continue to be, ever more important for data center customers.

The pressure from climate science, the ever-increasing negative impacts on the environment and scrutiny from governments means that the shift to a low-carbon economy has to happen now and fast. We're past the point for a slow transition.

The race for organizations to create a zero-carbon strategy is fierce and has become vital to an organization's future. Being able to discuss a company's negative carbon-emission rate definitely has become an attractive lure to potential customers and it is reassuring to current ones. However, in order to compete in the race, the right people are needed at the heart of this rapid shift toward corporate sustainability. People are needed to move departmental conversations about employee retention or reputation further toward executive discussions about product choices and change.



DIGITAL REALTY & SUSTAINABILITY

Global goals evolving to fight climate change and the industry impacts

Now headquartered in Austin, Texas, Digital Realty supports the data center, colocation and interconnection strategies of more than 4,000 firms via secure, network-rich data centers. Throughout North America, Europe, Latin America, Asia and Australia, 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. As of the end of 2020, Digital Realty's portfolio consisted of 291 data centers. Digital Realty leads the data center industry globally in sustainability and environmental performance. Both in 2020 and 2021, the company's stewardship was recognized by the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy with the ENERGY STAR Partner of the Year Award. Digital Realty became the first—and still only—data center company to be honored, specifically for its focus on driving sustainable design and operations on PlatformDIGITAL® (first-of-its-kind global data center platform for scaling business transformation and the digital workplace).

Furthermore, 31 Digital Realty facilities, representing 70 percent of Digital Realty's US footprint by capacity, have received ENERGY STAR certification. Compared to industry-average data centers, Digital Realty's ENERGY STAR-certified facilities reduce emissions by 678,000 metric tons of CO₂ per year and save 959,000 megawatt-hours (MWh) of energy, enough to power approximately 115,000 average US homes.

Digital Realty's sustainability accomplishments in 2020 that contributed to the award included setting a carbon reduction target with the Science-Based Targets Initiative (SBTi). During the pandemic, Digital Realty completed work towards reducing carbon emissions company-wide by 2030, in line with a 1.5-degree climate change scenario.



Digital Realty CEO A. William Stein said: "Entire industries have been reshaped during the pandemic as the shift to a digital economy accelerated. For our part, we have sharpened our focus on consistently implementing best practices in sustainability to welcome a new era of connected global data communities."

Digital Realty's strategy maintains a deep focus on their renewable energy, energy efficiency and supply chain sustainability initiatives. Environmental, Social and Governance (ESG) practices are key to continuing to grow business and support customers, while minimizing impacts on the environment, especially considering that 90 percent of their top 20 customers have shared sustainability goals publicly.

With a PUE of <1.29 Digital Loyang 2 data center in Singapore is one of the first to be awarded BCA Green Market for the New Data Centre V2019.V2 Platinum certification





DIGITAL REALTY'S STRATEGIC SUSTAINABILITY INITIATIVES

Pathways to achieving green energy goals

Extending the Reach of PlatformDIGITAL®

During the pandemic, Digital Realty continued to solve global coverage, capacity and connectivity needs for companies of all sizes through PlatformDIGITAL®—their fit-for-purpose global platform that simplifies access to data center and colocation capacity, and interconnection through a single data center provider, with tailored infrastructure deployments and controls. PlatformDIGITAL® provides customers a trusted foundation and proven Pervasive Datacenter Architecture (PDx™) solution methodology for scaling digital business and efficiently managing data gravity challenges.

In April 2021 Digital Realty extended the reach of PlatformDIGITAL® with Digital Loyang II or SIN12 in Singapore, a multi-story, 50-megawatt that represents their largest data center yet in the country. This significant expansion to Digital Realty in Singapore will enable local and multinational enterprises to deploy critical infrastructure and scale their digital business at the heart of a connected data community on PlatformDIGITAL®.

CEO Stein said, "The opening of our third data center in Singapore is a major milestone on our PlatformDIGITAL® roadmap. It underscores our long-term commitment to support the digital economy there, by bringing our total committed investment to date in Singapore to more than US\$1 billion."

Expanding Renewable Energy Agreements

Digital Realty recently announced renewable energy agreements to exponentially amplify their renewable energy capacity. In the Greater Dallas Metro Area, the partnerships are with Citigroup and with Pattern Energy's Phoenix Solar Project. The partnership with Citi will supply more than 260,000 megawatt-hours annually of clean, renewable energy annually, which represents 55 percent of the wind generation project output being developed by Bearkat Wind Energy II, LLC. The energy provided through the 162MW project will serve approximately 30 percent of the company's power needs of its 13 data centers in this market.

Digital Realty now will source solar power for their Dallas-area data centers from Pattern Energy's 82.5MW solar plant located in Fannin County, TX. Up to 310,000 solar panels at the Phoenix Solar Project provide around 85MW of renewable energy. Special attention has been paid to sustainability. All personnel will receive Environmental Awareness Training, plus a Critical Issues Analysis and Biological Resource Assessment were performed for the project site, which indicated no critical habitat for threatened or endangered species. With these two projects, soon Digital Realty's entire Greater Dallas portfolio will be powered by 70 percent renewable energy.

Additionally, Digital Realty now has agreement to source solar power for a portion of its Northern Virginia portfolio from ENGIE North America, as well as a utility green tariff with Portland General Electric (PGE) to supply renewable power to its Oregon data center development project. Together these will add 227,000 megawatt hours of new clean energy to Digital Realty's regional electric grids, enough electricity to meet the needs of 27,900 homes for a year.



The globalization of PlatformDIGITAL® is happening with Digital Realty Loyang II or SIN12 data center in Singapore



The Digital Realty Hillsboro PDX11 data center in Oregon features EV charging and 100 percent renewable energy through participation in Portland General Electric's Future Green Impact program



The rooftop solar project on Digital Realty's iColo NBO1 data center in Nairobi, Kenya



The roof of Interxion, a Digital Realty Company's Marseille data center campus where chilled water is piped in via the river cooling project

Bringing Solar Power to Africa

iColo, a Digital Realty Company, also recently introduced solar power for its operations in Kenya. Kenya's energy grid is 90 percent renewable, one of the most renewable grids in the world.

iColo implemented the Hybrid Solar System in Kenya, at their Nairobi and Mombasa data centres. The 400kW Solar Systems at NBO1 and MBA1 will support part of the power needs of each data center, which can deliver 825kW and 675kW of customer power (ITLoad) respectively. These installations are equivalent to planting 100 trees per week and reduces the data centers' CO2 emissions by 3,200 Kgs per week.

CEO of icolo.io, Ranjith Cherickel said: "One of our greatest natural resources in Africa is the sun and our investment in solar is a strategic part of our global vision to fight climate change as we continue to scale our business."

Cooling Rivers in France

Interxion France, a Digital Realty Company, announced in 2020 that it had achieved carbon neutrality and would maintain this commitment through 2030, becoming the first major French colocation data center operator to achieve this. Advancing its carbon neutral objectives, the company implemented a river cooling project for its two data centers in Marseille, which uses water from an old industrial facility for 99 percent of their cooling needs.

This renewable energy solution avoids the use of chillers, limiting data center energy consumption and carbon emissions. The river cooling project is expected to save 18,400MWh of energy and 795 tons of CO2 per year at full capacity. This is 30X more energy efficient than a traditional cooling solution, making Interxion's data centers in Marseille among the most efficient in France.

River cooling results in no potable water withdrawals, does not require chemical treatment of the water and protects local biodiversity. Additionally, the heat generated by the data centers will be fed into the urban heating network of some Marseille neighborhoods, supporting the needs of up to 5.4 million square feet of residential and commercial buildings.

In the following section InterGlobix Magazine's Editor-in-Chief Jasmine Bedi interviews Digital Realty executives, Erich Sanchack, Aaron Binkley and Lex Coors. Look for in-depth talks on sustainability in the industry, government regulations, best practices, setting green goals and the actualities of achieving them.

ERICH SANCHACK

Executive Vice President, Operations, Digital Realty

In his role at Digital Realty, Erich Sanchack is responsible for global portfolio operations and construction, cybersecurity and government relations, as well as supply chain operations. Throughout his career, Sanchack has had extensive experience in operational and business development roles in the technology and telecommunications industries, including building and operating data centers, and has held executive positions at firms like Lockheed Martin and CenturyLink Federal Solutions. A former Captain in the US Marine Corps, Sanchack served in Finance & Operations and completed multiple overseas deployments. Currently sitting on multiple board of directors, he has been repeatedly recognized for his efforts to drive technology innovation and positive community impact.

Data Centers globally consumed around 1 percent of the world's electricity in 2010 and around 3 percent in 2018. This is expected to grow to around 13 percent by 2030. What concerns does this present to our industry? What do you think are the steps that can be taken to alleviate those?

The digital economy and its fundamental growth is driven by data centers. Businesses of all types, but especially in the data center industry, need to modernize their infrastructure to support a larger growing number of users, clouds, data gravity demands and network performance, without increasing—and hopefully negating—electricity consumption by being as efficient as possible. As data centers continue to grow, we are seeing energy use grow at a much slower pace. The in-house data centers have been displaced by outsourced third-party data centers and cloud providers who run much more efficiently than the in-house data centers.

We have a very advanced strategy and roadmap that allows us to lead the change, as opposed to being reactionary to it. In 2020, our Operations team performed energy audits on 23 percent of our global managed portfolio by square feet, targeting projects at properties that would deliver significant efficiency and cost savings. Implemented projects resulted in an estimated 21,800MWh and \$2.4 million in energy efficiency savings, equivalent to the electricity needs of 2,500 homes for one year. We have exceeded our 2020 Power Usage Effectiveness (PUE) improvement targets, achieving 11 percent improvement.

Data centers have become some of the largest consumers of renewable energy. How will large providers' green strategies make clean energy more available and affordable?

We are one of the largest buyers of renewable energy among data center providers and have certified more green buildings than any other data center provider. Our scale enables us to buy cost-competitive renewable energy at utility scale, which is making more clean energy available to more and more of our customers. We doubled Green Power use between 2019 and 2020.

We utilize 100 percent clean power in Europe, with 50 percent renewable power supply globally. By 2018, we were the largest participant in the US DoE's Better Buildings Challenge, and we exceeded our 20 percent energy efficiency target ahead of schedule. As an example, if you look at our Greater Dallas portfolio, it will be powered by approximately 70 percent renewable energy by the

end of 2021, made possible via the two renewable energy contracts that we announced last year. Our agreement with Citi will provide over 260,000+MWh of renewable energy annually, representing 55 percent (89MW) of the wind generation project output being developed by Bearkat Wind Energy II, LLC. And our new long-term power purchase agreement sources 65MW of solar power from Pattern Energy's Phoenix Solar Project located in Fannin County, Texas. Our overall renewable energy efforts have resulted in 2.3 million metric tons of CO₂ equivalent emissions (MtCO₂e) avoided in 2020, enough to power 415,000 US homes annually.

As the largest global provider of cloud-and carrier-neutral data centers, how do you see your sustainability goals, along with your customers', being achieved?

When it comes to sustainability, there's nothing that's off the table for us. We recognize that operating and expanding our business consumes resources, such as energy, water and raw materials. We acknowledge our responsibility to deliver solutions that improve on our environmental effects. We want to lead the global data center industry in sustainable environmental performance, and I believe that we are doing just that.

These are just a few of our actions undertaken as part of our efforts to be the recognized leader in global data center solutions:

- 🔄 Measuring and reporting key metrics related to energy, water and carbon for the global portfolio, with the long-term goal of regularly reporting performance for all properties.
- 🔄 Starting to enable clients to procure clean, renewable energy for data center operations, with a long-term target of availability to all clients.
- 🔄 Refining design, construction and operational standards, in order to reduce the environmental footprint of facilities, with the goal of continuously reducing energy and resource consumption.
- 🔄 Certifying buildings in our portfolio in accordance with recognized certification systems, with a long-term goal of receiving certifications for all new properties.

With our adoption and expansion of wind and solar resources on the rise, we still want to go further to provide better access to renewable energy to our customers. We are planning deployment of new technologies in the coming year that will drive further efficiencies in our sustainability programs.



Earlier this year Digital Realty became the first data center company to become a member of the WaterReuse Association. What is the strategic importance behind these moves, especially how have they impacted WUE?

We wanted to network with businesses and other entities that use recycled water for the purpose of optimizing Water Usage Effectiveness (WUE). We were the first data center operator to join the WaterReuse Association's Recycled Water User Network. It was important for us to join with organizations whose water-conservation goals aligned with our own. At Digital Realty, we stand upon our past success of delivering tangible, recorded water conservation results, while looking to the future to continue to work to protect and conserve our planet's limited water resources. Our membership includes a designation that recognizes our achievements as a steward of water resources in the local community.

Our global water strategy addresses the strategic role that water plays in Digital Realty's operations by identifying regions where water quality and scarcity pose a risk to reliable data center operation, and in creating a pipeline of projects and opportunities to advance our role in water conservation. Our standard cooling system design doesn't use water for cooling, so we reduce stress on local freshwater resources.

What was the importance behind Digital Realty signing up with UN-backed Science-Based Targets Initiatives (SBTi), as well as its relevance toward the company cutting carbon emissions by 2030?

We value information sharing and partnerships and have a particular relationship with government bodies. In 2020, along

with more than 1,200 companies from other industries, we joined the Science-Based Target Initiative (SBTi), and set an aggressive carbon emissions time-bound goal, in line with climate science. The prescribed set of sustainability goals means to steer the company toward cutting carbon emissions by 2030, reducing levels required to keep global warming below 1.5°C, from pre-industrial levels.

As the first data center operator of our size and global reach to join the SBTi, we have committed to reducing our Scope 1 and 2 emissions (direct and indirect company emissions) by area by 68 percent and Scope 3 emissions (indirect emissions in our value chain) by area by 24 percent by 2030. Achieving these goals will expand our focus on renewable and clean energy initiatives and low-carbon development and supply chain sustainability.

By following the goals set by the SBTi, Digital Realty will be investigating how to transform the way it does business in a number of ways. The science-based target for us is really business-wide, not just renewable energy sourcing. It's talking to our suppliers and working with them to bring products to us that have a lower embodied carbon footprint into our new data center designs and our retrofits. It includes fuel use such as natural gas and diesel and considers our business operations. Our collaboration with the SBTi has already built on the work done in the decade prior by Digital Realty to improve the environmental performance of its operations. These have included renewable energy purchase agreements, investments in improving the energy efficiency of our global data centers and greenification of architecture for our facilities.

AARON BINKLEY

Senior Director of Sustainability, Digital Realty

As the Senior Director of Sustainability for Digital Realty, Aaron Binkley participates in sustainability matters for industry groups such as NAREIT and the US Green Building Council. His focus areas have been in energy conservation, renewable energy, sustainable construction and corporate responsibility reporting. Additionally, Binkley is a registered architect, with an MS from MIT in Real Estate Development, a LEED™ Accredited Professional and has written widely about sustainability in real estate. We sat down with Binkley, an expert on sustainability topics, to cover his thoughts on clean-energy initiatives in the data center industry, implementing programs based on environmental, social and governance (ESG) data and what it takes to attract investors.

Digital Realty has set many goals with regard to clean energy and greener initiatives overall. As a company operating worldwide, how do you go about creating a Sustainability roadmap to best handle the industry's challenges on a global level?

When it comes to Digital Realty in general, parts of our sustainability roadmap cover: a) empowering employees and clients to improve resource efficiency in areas such as energy, water, waste and carbon; b) providing data center solutions that deliver industry-leading energy productivity and resource efficiency, plus increase client value and lower cost of ownership; and, c) communicating our performance regularly and transparently with stakeholders.

We think about Sustainability holistically from an environmental, social and governance (ESG) standpoint. We recognize that there are variations both regionally and globally, and that we can't have a one-size-fits-all solution. We try to set the tone from the top, in terms of global commitments, goals and roadmap. We give the regions and various business units the flexibility they need to customize the solutions and programs in order to execute against those goals. We work with our regional teams very closely and we coordinate with a number of business units and functional areas to ensure their efforts around energy efficiency, water conservation, renewable energy and carbon emissions reduction. And, we've been focusing on renewable energy sourcing, which my team leads in partnership with our energy supply chain team.

In conjunction with a UN program, we set a science-based target to reduce our global carbon footprint by 68 percent by 2030 (compared to our 2018 baseline). That's really driving us on a go-forward basis to have a company-wide, top-to-bottom approach and commitment to reduce our business' footprint. We work closely and collaboratively with our customers and partners to ensure that both their sustainability goals and ours are achieved. This could entail working directly with a customer on a renewable energy project or solution, it could be working with a customer to improve energy efficiency in a multi-tenant data center or other initiatives that fit into those categories. You will be seeing a long-term focus from us on all of the elements that we need to bring significant change in reductions to our carbon footprint.

Finally, in this journey it is very important how we communicate our progress, especially being transparent about it with our customers and the outside world. We issue a yearly comprehensive ESG report, extensive additional communications around the sustainability

initiatives that we have underway that really demonstrates where we are in this journey with our customers and with the industry in a collaborative way.

Can you talk about the importance of digitalizing your ESG data? What implications has it had on your overall Sustainability Program?

One of the things that sometimes arises as a challenge is trying to do everything, green energy programs, volunteering, et. al. To really be successful, companies need to focus and prioritize. By looking at our ESG data, we are able to prioritize focus areas and better shape our sustainability roadmap. I see the need for ESG data to be expanding significantly. The expectations for accurate and transparent data are becoming much more front and center, and that is essential to having an effective and credible program. Accurately measuring ESG data is key to the proper management of it, and we continue to have good visibility on our ESG metrics.

My team coordinates the ESG reporting and supports green bond issuances from the sustainability perspective, and we handle most of the customer and investor-facing sustainability and ESG dialogue taking place. Digitizing our ESG data has helped us improve our data quality and completeness, which underpins everything that we do as a team. We were able to combine our existing data with data from Interxion as we put together global targets. Having good data, as a result of digitizing it, has enabled us to set achievable global goals and set our roadmap for the future including science-based targets combining both assets globally with Interxion's in Europe.

How important are the sustainability practices of data center providers to the investment community?

It is important to make sure the investment community understands some of the unique features of the data center industry such as these facilities being 24x7 highly resilient facilities. Data centers are big buildings and are essential to the digital economy and that these facilities can be sustainable and green. The general initial perception among the non-data center industry stakeholders is that data centers are big buildings that can't be energy efficient and sustainable. The reality is that data centers not only can be very sustainable, but also be actual leaders in sustainability.

Green construction combined with the technologies, the systems and the solutions that are aligned with sustainability goals enable



us to build and operate our data centers just as sustainably as an office building or any other asset class. Data centers are, in fact, driving a more sustainable future. Data centers can operate, be built and powered in a sustainable manner. Being able to bring that to the investment community broadly, and to socially responsible investors, is another benefit that we've seen throughout the years. We are currently operating on 50 percent renewable energy across our global portfolio.

Green bonds allow us to tell our story and to show that data centers can be responsible and reduce their impact on the environment. We started this initiative in 2015 with our first green bond and were the first data center company to issue a green bond. We have issued eight green bonds since then. We are currently the largest issuer of green bonds in the REIT industry. This demonstrates that we have a commitment to raise debt that will fund the growth of our business, and we are committing to doing that in a sustainable manner with a direct and open dialogue with the investment community.

How has Digital Realty handled the recent surge in the data during the pandemic and its implications to sustainability?

The pandemic has made clear how dependent society has become on data centers and digital infrastructure. Many industries and economies were largely shut while data traffic and energy use

have been reaching new and all-time peaks. From the onset of the pandemic we have been actively working with our teams, partners and customers. We have pandemic response plans and have conducted pandemic preparedness drills across the organization.

Our facilities are very resilient and have performed as expected, without any interruptions. We noticed that some of our customers' energy utilization increased, while others did not. We did see an overall increase in energy consumption across our footprint globally, and we were able to reduce our carbon footprint. We were prepared to handle the increased loads in a very energy-efficient manner, ahead of our science-based targets. We did see a slight reduction in water consumption driven primarily by lower staffing levels at the site.

To best handle the industry growth, we have expanded operations, both organically and through acquisitions of companies that align with our goals, like the merger with European colocation provider Interxion. By May 2020, this growth had contributed to our firm's energy footprint, which nearly doubled in just a few years, while the volume of carbon emissions generated by our operations had declined by 15 percent. In addition to our recent influx of data centers going into Northern Virginia, new, or acquired data centers are being put in place worldwide. We place a high priority on sourcing net-new renewable energy as we expand our portfolio, and each market has its own unique pathway to identifying and realizing impactful and cost-effective renewable solutions.

LEX COORS

Chief Data Center Technology and Engineering Officer of Interxion: A Digital Realty Company

We talk with the Chief Data Center Technology and Engineering Officer at Interxion: A Digital Realty Company, Lex Coors about ideas on the big diesel generator debate, Europe's data center sustainability aspirations and more. Throughout his 30-year career, Coors has built exceptionally strong credentials in the design of versatile, cost-effective and energy-efficient data center infrastructures. He pioneered several new approaches to design and management, like the first modular approach to data center architecture or improving the power-ratio efficiency between server load and transformer load. Coors is a visiting professor at the University of East London and the Chair of the EUDCA Policy committee. He serves as a Board member of the Climate Neutral Data Center Pact.

How has Interxion driven sustainable approaches to renewable energy and sustainable DC design throughout Europe, the Middle East and Africa (EMEA)?

Visionary designs for data centers and using sustainable, efficient energy sources are sometimes sacrificed to keep construction costs low. At Digital Realty, we have set the bar very high for energy efficient designs, with zero (or very low) use of water for adiabatic cooling purposes and the procurement of 100 percent renewable energy. We have made our Corporate Social Responsibility (CSR) values a top priority. Whilst this may result in higher initial data center construction costs, we benefit from lower operating costs and energy usage long term, which generates a significantly lower total ownership cost. These strong CSR values feed into the industry via our engagement with the European Data Centre Association (EUDCA) and the development and launch of their Climate Neutral Data Centre Pact.

Addressing the increasing reliance on IT and network infrastructure, the Uptime Institute formed their EMEA Network in 2007. Back then, Interxion was the only participating carrier neutral data center provider to engage. Subsequently, Uptime Institute established itself as one of the leading, unbiased sources of information on Best Practices for data center design, construction and management. It has handled the creation and administration of the Tier Standards and Certifications for Data Center Design.

Currently, 100 percent of our energy in EMEA is procured from renewable sources. We've pioneered energy-saving designs and harnessed any available resources, like arctic winds, underground aquifers and the Baltic Sea, to reduce our carbon footprint. Constantly innovating to improve how we design and operate our data centers means new ways for energy efficiency or cutting carbon emissions and waste.

Since the merger with Digital Realty, the company further increased efforts to drive the sustainability across the EU through leadership on the EUDCA and Climate Neutral Data Center Pact. Can you outline your role and next steps for the industry?

I'm the Chair of the Policy Committee of the EUDCA. We communicate twice a year with EU ministers and regularly receive questions on data centers issues, like battery energy storage, hydrogen and many others. To date, this communication has been well received, and consultations have gathered pace. We are committed to achieving the sustainability goals outlined by the EU to make data centers in

Europe carbon neutral by 2030. This is a self-regulatory initiative following the adoption of the European Green Deal. Through the EU Climate Neutral Data Centre Pact, we aim to:

- 🔄 Improve energy efficiency with measurable targets
- 🔄 Procure 100 percent carbon-free energy
- 🔄 Measure and set ambitious water conservation targets
- 🔄 Reuse, repair and recycle servers and other electrical equipment
- 🔄 Look for ways to reuse waste heat.

With your close involvement with the EU and advisory role to various organizations, how do you see government and new / updated regulations pushing the industry to become cleaner and greener?

The EU is going to be asking for more data, on top of what already is reported to the EU Code of Conduct for Energy Efficiency in Data Centers initiative. We will have to start reporting on square meter usage, energy consumptions, capacities and other metrics. The EU wants to better understand this industry. What is it? How quickly is it growing?

With the self-regulatory framework of the Climate Neutral Data Center Pact, we have an agreement with the EU and cloud providers to come up with a plan. We have five pillars for that: energy efficiency, carbon free energy, water conservation, recycling of equipment and materials, and reuse of waste heat. The EU is not asking the data center sector to run on hydrogen. The EU is talking about the 2050 roadmap, and considering hydrogen as a means of storage and starting to offload coal power plants. They're not asking the data center industry to have their own hydrogen plants, because that doesn't make sense now, due to the absence of a green hydrogen supply chain, and also the perceived risk of storing large volumes of hydrogen in communities.

You recently outlined thoughts for reducing the use of diesel in your operations. What innovations are on the horizon to reduce DLR's carbon footprint, working toward ESG goals?

When reducing our carbon footprint, we see the benefit of phasing out diesel generators, scrapping them and replacing them with new technology like hydrogen. However, the availability of a truly green hydrogen supply is some years off, so we need interim solutions.

One potential solution was using diesel generators only when we lose the grid. However, on discussion with the diesel generator



vendors, it was clear that we had to start the diesel engines for testing purposes. When I reached out to our manufacturer, who also works with Mitsubishi, saying that we only want to start these generators when we lose the grid, I was told that's not possible. Looking for a solution, we compared it to a Mitsubishi engine, thinking through possible innovations. Our manufacturing partner, Kohler and Cummins, indicated their willingness to work with us and we hope to find a solution in the future.

As opposed to running sites on diesel generators under test conditions, I'd prefer buying clean energy off the grid. This supports the development of additional wind and solar plants. Meanwhile, we can take the time to build a new hydrogen transport network, as fuel cells need very clean hydrogen. Although, there is the problem of large-scale hydrogen storage to overcome. I think the acceptance gap on fuel cells has been closed. Dean Nelson has led the way on this with his data center in Utah for eBay a few years back. Imagine you have a 20- or 40-megawatt data center at some location, yet you don't have a hydrogen grid nearby. So, you have to figure out how to get the hydrogen there. It's a supply chain issue. The other innovative energy storage solutions to help reduce reliance on diesel generation that we looked at include large scale battery energy storage, liquid and compressed air energy storage and even gravity-based energy storage solutions.

Whilst some of these will turn out to have legs, we still have generators that consume diesel fuel. One immediate solution, which is currently in trials, is the adoption of HVO fuels across our generator fleet. This would significantly reduce our environmental impact from diesel emissions.

Finally, improving the reliability of the grid is another way to reduce the need for back-up power solutions. In Europe we're building substations (100kv/200kv) integrated into the mesh of the super grid, thereby improving the reliability of the grid supply to the data centers. If you do not need to start the diesel engines for your generators, you can run all the time on the and buy green energy directly from the utility provider. Engine run-free maintenance is a solution, for now.

In addition to your role at Interxion, you're a visiting professor at the University of East London, working on the sustainability and energy challenges for data centers. What are key focus areas being tackled?

When we started in this industry, we didn't know which way it would go. Now, we are creating a whole new world. As part of my work at the University of East London, we investigate issues around holistic sustainability for data centers. An important element of this is how to engage with and educate key stakeholders, such as government policy developers, both at country and EU level. We all know that policies developed by stakeholders with insufficient knowledge can lead to negative and unintended consequences and turn out to be highly counterproductive.

An example would be a knee-jerk reaction to generators, outlawing use across the industry, before alternative technology even develops to take their place. As an industry supported by appropriate academic resources, we can work more effectively with governments to ensure that the right technologies are identified, and their adoption incentivized. All stakeholders must understand that sustainability requires an evolution in technology, which needs support from the government down through the industry.



*In this section, three Digital Realty partners, **Schneider Electric, WaterReuse Association and CoolestDC** share the trend of current projects toward green societal requirements, turning companies into good citizens, always.*

SCHNEIDER ELECTRIC

KEVIN BROWN SVP, EcoStruxure Solutions, Secure Power Division

Schneider Electric's purpose is to empower all to make the most of our energy and resources, bridging progress and sustainability for all. The company provides endpoint to cloud integration that connects products, controls, software and services. They enable lifecycle solutions, from design and build to operate and maintain phases through a digital twin. Then, they deliver capabilities to transform from site-to-site to an integrated company management. Schneider Electric's Senior Vice President of EcoStruxure Solutions, Secure Power Division shares about their partnership with Digital Realty. His team is responsible for consulting with Cloud Service Provider, Commercial/Government end users & agencies for their data center physical infrastructure needs. Brown is responsible for the Data Center Infrastructure Management (DCIM) and IT infrastructure management software business, which provides customers insight into the resiliency and availability of their infrastructure. He also serves as head of the Energy Management Technology Research Center, which researches market trends and creates content that helps customers make smart and pragmatic business and technology decisions.

What was the strategy behind the partnership with Digital Realty and Schneider Electric?

We have some big challenges in our industry that are forcing a change in how our ecosystem functions. To support its colocation and expansion goals, Digital Realty has been proactive in taking the lead in the industry and engaging with Schneider Electric to leverage our expertise and solutions. For example, Schneider Electric helped customize an EcoStruxure solution to unify, monitor, and control their facilities, from anywhere in the world, at any time. Our innovative EcoStruxure platform provides the reliability, scale, and visibility that was demanded. We also installed what we call EcoStruxure Pod Data Centers, our integrated rack systems, which provided the flexibility Digital Realty requires to fit customers' varied configurations with reduced installation times and faster deployment.

Digital Realty's VP of Supply Chain and Procurement, Brent Shinall shared, "In order for us to achieve global consistency, we need a partner that can provide software, products and services consistently, on a global level. Schneider Electric is definitely a partner providing innovative and value-adding solutions for our infrastructure needs."

What are the priorities for Schneider Electric regarding sustainability? In your opinion, what role will a partner like Digital Realty play in meeting those goals?

When it comes to sustainability, I believe the industry needs to do a much better job on metrics. For example, while PUE is not perfect, it



Digital Realty partnered with Schneider Electric because they needed a globally consistent infrastructure to support its aligning data-driven sustainability goals

drove activity and changed the dynamic within the industry. In the last decade, our models show that on the whole we have reduced energy waste by around 80 percent, and PUE has played a pivotal role in driving this improvement. But we're now reaching the limit of what is possible on the facility side in terms of efficiency. Data centers have been focused on electrical efficiency and it's important but it's only one part of sustainability and we need the metrics to help drive the activity.

How do we get clear benchmarks when it comes to sustainability?

Some people believe the EPA's three Scopes for Green House Gas emissions are pointing us in the right direction and Schneider Electric is offering new sustainability services. We are in a good position to do that based on our experience in sustainability, which has been a company focus for the past 15 years. We were just named the most sustainable company on the Global 100 index. It is our mission to be our customers' partner for sustainability, providing energy efficient hardware and leading the digital transformation to more sustainable and efficient data center.

As for Digital Realty, it is leading the way toward greater

In 2020, Digital Realty committed to reducing its Scope 1 and 2 emissions (direct and indirect) by 68 percent in more than 290 of the data centers they operate in 24 countries. This is in line with a 1.5-degree climate change scenario confirmed by the Science-Based Target Initiative for reduced carbon emissions by 2030.

sustainability—using data to get real results. We align and support them in these efforts. Digital Realty works hand in hand with Schneider's research and development teams to optimize energy-efficient equipment, such as cooling infrastructure and power supply, and develop software to track performance metrics. In addition to data center design, our companies have collaborated on broader sustainability initiatives like our partnership on the Calanques National Park Seagrass project pilot. The purpose of this project is to establish the first methodology for the certification of seagrass conservation and preservation measures as part of the Low-carbon certification project in France.

Why do you think the need for decarbonization is so time-sensitive? Are organizations around the world doing enough in closing the gap?

Organizations around the world are not doing enough to close the gap and simply put, we need to do more. I look at sustainability in data centers as a complicated, long-term challenge. It's clearly a business issue. Customers are demanding it, and legislation may require it. Investors are expecting it. All of this is driving the C-Level to look at sustainability as part of future success. And our industry is in a great position to meet this challenge through our innovation. As I mentioned, we reduced energy waste by 80 percent, so I am optimistic about this challenge and the future. We need to do it, our customers need to do it, and we all recognize that we must work together in new and different ways to accomplish it.

Our sustainability consulting services continue to attract more and more customers in need of climate change and supply chain decarbonization advisory services and digital solutions to accelerate their own transformation. Since 2018, Schneider Electric has helped our customers save and avoid 302 million tons of CO2 emissions. This is all part of our larger mission at Schneider Electric because we believe access to energy and digital is a basic human right.



WATEREUSE ASSOCIATION

PATRICIA SINICROPI Executive Director

The WateReuse Association is the only trade association in the US solely dedicated to advancing laws, policy, funding and public acceptance of recycled water. Established in California in 1990, WateReuse now has members in 38 US states and 11 countries who are developing safe, reliable, locally controlled water supplies. The Recycled Water User Network™ was created as a members-only network for businesses, governments and nonprofit organizations that use recycled water. As Executive Director of the WateReuse Association, Patricia Sinicropi discusses water sustainability and resiliency, and the role Digital Realty plays in its progress. Sinicropi leads WateReuse in engaging members and leveraging relationships with other stakeholders to build support for water recycling. She has over two decades of experience as a policy expert and advocate on water-related issues in Washington, DC.

As the only trade association dedicated to advancing all aspects of recycled water, how do you make progress happen?

The WateReuse Association represents a vast community of water reuse thought leaders, scientists and practitioners that share best practices and form a unified voice for advocacy on policies that support water reuse. Our membership includes nearly 250 utilities that incorporate water recycling into their water management strategies to ensure a resilient water supply for over 70 million people in US. We now have members in several other countries as well.

We engage our members and leverage relationships with other stakeholders to build support for laws, policy and funding that facilitate more widespread adoption of water recycling. We also develop tools and resources to educate water professionals, businesses that use water in their operations, and the public on the value of recycled water. Today's technology allows us to treat any source of water to a quality sufficient for any end use, including drinking, irrigation, industrial processes, groundwater replenishment, and environmental restoration.

With time spent working with government entities, what are the latest developments in water recycling to be aware of for anyone interested in water recycling, specifically in the data center industry?

In August 2021, the U.S. Senate passed bipartisan infrastructure legislation, the Infrastructure and Jobs Act, which will invest \$1 billion in five years in water recycling programs for the Western United States. Of that, \$550 million will go to the Title XVI Water Reclamation and Reuse grants program, with \$450 million available through a new grant program for large-scale water recycling projects.

Our Association worked closely with specific congressional champions to secure this funding.

This is an historic investment in water recycling, compared to the roughly \$65 million per year appropriated to Bureau of Reclamation water reuse programs previously.

This new legislation also contains a second WateReuse priority—the creation of a federal Interagency Working Group on Water Reuse, which we developed the proposal for, ushered through earlier legislation and into the bipartisan package. The Group will break



At WateReuse, member engagement is key to our success. We provide a community for those involved with recycled water to share best practices and advocate for supportive policies.



Purple pipe is used to delineate recycled water coming from the OASIS reuse plant in Pompano Beach, Florida

down silos, leverage resources throughout the federal family and facilitate stakeholder engagement on water recycling.

Digital Realty was the first member to join the WateReuse Recycled Water User Network, can you tell us more about that and the networking arm of the trade association?

At WateReuse, member engagement is key to our success. We provide a community for those involved with recycled water to share best practices and advocate for supportive policies. Our goal with the Recycled Water User Network (RWUN) is to create opportunities for water agencies to engage with recycled water users and for businesses that use recycled water to engage with each other. The RWUN is open to businesses, governments, and nonprofit organizations that utilize recycled water for operations, including customers of water utilities and businesses that recycle water onsite within their facilities.

In addition to knowledge sharing, technical education and networking, RWUN members receive a blue designation to recognize their water stewardship: the WATERSTAR®. Digital Realty recently became the first to join the RWUN, receiving the WATERSTAR® in recognition of the international colocation company's achievements as a steward of water resources in local communities.

Water stewardship is an important initiative for the data center industry, particularly in areas of water scarcity. They utilize water-efficient or free cooling technologies and tap into reclaimed water supplies where available. In 2019, Digital Realty added three sites that use non-potable water, making a total of 43 percent of their global water supply (more than 661,800 kGal) that was provided by reclaimed or onsite recycled water, up from 35 percent in 2018.

Can you elaborate on specific examples from Digital Realty behind their strategy to lead water conservation efforts?

Digital Realty recognizes that operating and expanding their business consumes resources, like water. We proudly invited them to join because they take responsibility and deliver solutions that improve environmental performance.

Their moves have been strategic in the water sector to advance and extend the company's role in the data center industry. Digital Realty also announced an agreement with Nalco Water in 2019, a global leader in water management technologies, which increased company efforts to optimize water use through reduction, reuse and recycle projects.

A great example is one of the most sophisticated and efficient colocation data centers in the greater San Francisco Bay area. Digital Realty's SJC10 Silicon Valley Data Center in Santa Clara, CA, uses municipally treated recycled water to meet 50 percent of its cooling needs.

The Silicon Valley data center includes an 8,000-ton central plant, with a 500,000-gallon TES tank and N+2 redundancy. The computer rooms housing server racks consist of 240 CRAC units with redundant looped chilled water piping throughout coming from two 500,000-gallon above ground chilled-water storage tanks.

Another example is that since 2013, Digital Realty has implemented water-free cooling across more than 344 megawatts of capacity. Using pumped refrigerant with economizers to maximize free cooling and deliver high levels of energy efficiency, compared to tower-based infrastructure, these systems eliminate the need to use water to provide temperature control. These save approximately 1.03 billion gallons of water per year, enough to meet the annual needs of 20,500 households.

COOLESTDC

DR. PS LEE Founder

CoolestDC Pte Ltd (CoolestDC), a spin-off of the National University of Singapore (NUS), is a deep tech thermal, power, performance and carbon management company. They specialize in high performance and efficiency thermal management solutions for electronics and data center industries, including offering extensive engineering and integration services. Digital Realty is piloting an initiative with CoolestDC to use integrated liquid cooled racks to significantly reduce the power & water consumption and carbon footprint and to improve the IT performance. Dr. PS Lee is the Founder of CoolestDC and the Program Director for the Cooling Energy Science & Technology Singapore (CoolestSG) Consortium at the National University Singapore (NUS). His current roles include serving as the Executive Director of Energy Studies Institute, Director of Singapore Energy Center and Director of Center for Energy Research & Technology (CERT). He shares how his CoolestDC team partnered with Digital Realty to pilot commercializing their liquid-cooling solutions.

What do you think about the state of the data center industry at the moment in Southeast Asia, specifically Singapore? What has been the inspiration behind your work?

Singapore currently houses around 60 percent of Southeast Asia's data centers, consuming almost seven percent of the island nation's total energy expenditure. This is only expected to increase to 12 percent by the decade's end. The city-state put a moratorium on data center construction in 2019, citing the "intensive" use of electricity and the environmental strain of heavy water use.

To ensure reliable operation of data center, there is a need for constant temperature and humidity regulation which can be an energy sapping exercise in particular under hot & humid tropical climate—cooling can represent up to 35-40 percent of data center's total energy consumption. Compounding this, the power densities of servers are getting higher and higher with every new generation, so much so that conventional air cooling is increasingly not sufficient. The motivation behind my work has been to look into how we can make data center cooling sustainable in the Tropics. Solutions include evaporative cooling and variants of liquid cooling including immersion cooling and direct chip liquid cooling. CoolestDC is working to make liquid cooling easy to use and scale while achieving sizeable reductions in cost and energy.

Southeast Asia uses a small share of renewable energy sources. How is the industry in the region handling adopting new technologies that reduce their carbon footprint, like liquid cooling?

Data center players should move away from conservative approaches. Liquid cooling technology is widely used in high-performance, energy-intensive sectors, such as computing and gaming, and long has been considered the preferred solution to effectively cool down heat-intensive CPUs and SSDs. I do not expect the switch overnight.

With concerns about operational complexity and capital costs associated with liquid cooling solutions, data center operators prefer traditional air cooling. Data center players that do not embrace more



I believe that liquid cooling is an overlooked technology that can give enterprises and data center operators in tropical locations a sustainability boost with substantially reduced energy consumption by 20-30 percent and water usage by up to 50 percent.



efficient cooling technologies face greater cost and operational problems in the long term. Industry experts have highlighted that given the rate of growth in data usage and adoption of newest digital technology, air-based cooling will not be sufficient to serve the needs of data centers. At the minimum, existing/brownfield data centers could start by considering solutions that do not require a complete infrastructure overhaul, but that can be integrated with or added to existing infrastructure. I believe that liquid cooling is an overlooked technology that can give enterprises and data center operators in the Tropics a sustainability boost while substantially reducing energy consumption by 20-30 percent and water usage by up to 50 percent.

In creating CoolestDC, what has its role been in the region with innovations in liquid cooling technologies?

At CoolestDC, our team specializes in high-performance and high-efficiency thermal management solutions for the electronics and data center industries, including offering extensive engineering and integration services. When deploying liquid cooling, trained system integrators or specialists are needed to ensure system reliability.

CoolestDC's high efficiency liquid cooling of servers can lead to significant reductions in cooling system power consumption, IT (server) power consumption, water consumption, carbon footprint (since total power consumption is significantly reduced) and remarkable improvement in IT performance.

Our chiller-less hybrid cooling solution during original testing is able to achieve a partial power usage effectiveness (pPUE) score of 1.2 during original testing, with the potential of further lowering down to 1.1 (with the ideal score being 1). If air cooling is replaced by liquid cooling on a large scale, it will bring down not only PUE, but also Water Usage Effectiveness (WUE) and overall energy efficiency and costs. Data centers will be in a stronger position to drive ongoing

increase in power densities that will come with the new generation of servers.

What have been the results of CoolestDC and Digital Realty teaming up to create innovative sustainability solutions for their data centers?

Most notably, Digital Realty is piloting the commercial deployment of CoolestDC integrated liquid cooled rack solutions. While the test-bedding is still on-going, we have obtained very exciting and impactful results for our liquid cooled compute pod (LCCP) configuration, for example at 60 percent loading, we recorded 29 percent savings in rack power consumption and 39 percent improvement in IT performance. Such hard data will be very useful in encouraging the industry players to consider the benefits, in the interest of both economy and environment, that liquid cooling can bring to their data center operations, and hence to make the switch faster. Additionally, once set up, it is easier to maintain than air cooling and can be scaled quickly.

How do you see Digital Realty best using Liquid Cooling in standard practices?

Digital Realty's Singapore data centers are their most efficient ones in Southeast Asia. When Digital Realty opened their third data center in Singapore (SIN12) it was state-of-art, with features like new green standards for power / energy and evaporative cooling systems, which made it well-suited to our tropical climates.

In regard to switching industry practices in the future, I am encouraged by Digital Realty's strategic partnership with CoolestDC, as well as the government, around establishing a sustainable data centre industry in Singapore. It's not only about making our data centers more efficient in how they manage energy and the associated carbon footprint, but also about driving more renewables into the grid and accessing them. ☺