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Best Practices for Colocation Data Centers:

A Guide to Maximizing Renewable Energy Mix



About This Working Paper

This working paper presents best practices and exploratory concepts to help colocation data center (colo) owners and users address the challenges and opportunities to maximizing the use of renewable energy at colo facilities in the United States. In 2010, data centers made up more than 2 percent of electricity usage in the United States,¹ and while colo facility usage continues to grow, so do ambitious sustainability commitments by colo owners and users. Companies in the technology industry not only own and operate their own data centers, but also are prime users of multi-tenant colo data centers—facilities that are owned and operated by professional service providers. There is growing interest among both colo owners and users about the source of the electricity used to power colo facilities, and increasing renewable energy is a paramount goal for both parties. This working paper intends to support the dialogue between colo owners and users as they seek ways to maximize reliable, affordable, and renewable power sources. We welcome feedback and encourage collaboration to seek solutions.

METHODOLOGY

Commissioned by BSR's [Future of Internet Power](#) collaborative initiative, this work is based on a review of the literature as well as interviews with colo owners, colo users, and renewable energy advocates and technical experts, who are listed in the Appendix. This paper was researched and written by Kelly Gallo with contributions from Aditi Mohapatra. Any errors are those of the authors; please direct comments to Kelly Gallo, kgallo@bsr.org.

ABOUT THE FUTURE OF INTERNET POWER

Founded in 2012, the Future of Internet Power is a group of leading technology companies that develop and promote best practices to maximize renewables at data centers; we envision an internet powered by 100 percent renewable energy. As of January 2016, Future of Internet Power members include Adobe, Akamai Technologies, Autodesk, eBay, Etsy, Facebook, Hewlett Packard Enterprise, LinkedIn, Salesforce, and Symantec.

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DISCLAIMER

Working papers contain preliminary research, analysis, findings, and recommendations. They are circulated to stimulate timely discussion, critical feedback, and to influence ongoing debate on emerging issues. Most working papers are eventually published in another form, and their content may be revised. BSR publishes occasional papers as a contribution to the understanding of the role of business in society and the trends related to corporate social responsibility and responsible business practices. BSR maintains a policy of not acting as a representative of its membership, nor does it endorse specific policies or standards. The views expressed in this publication are those of its authors and do not reflect those of BSR members.

¹Jonathan Koomey, "Growth in data center electricity use 2005 to 2010" (Oakland, CA: Analytics Press, 2011) www.analyticspress.com/datacenters.html.

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Introduction: Making Renewables Work at Colocation Data Centers

Owners of colocation data centers (colos) provide ongoing, reliable service to maintain their tenant's IT operations, and therefore are in a unique position as a key component between their customers and the energy providers who supply power to their colo facilities.

Given the nature of internet-based businesses that rely on data centers, colos are filling a growing niche for convenient, reliable, and cost-effective services. As technology companies and other data-driven businesses look to extend their sustainability commitments across their supply chains,² companies that use colo services have identified **colo facilities as an opportunity to decrease operating emissions by switching away from conventional energy sources and toward clean, renewable power**. As a result, colo owners increasingly take into consideration their customers' energy preferences, and there is growing momentum for aligning renewable power goals among colo owners and users. While both groups are seeking renewable energy sources, neither thinks of itself as being in the energy business and therefore face various challenges—state utility regulations, infrastructure costs, generation capacity, power contract terms, among others—when trying to navigate a complex industry to find solutions.

In conjunction with the need to increase procurement of renewable power, colo owners and users face the **challenge of establishing a more comprehensive and standardized arrangement** through which they can convey renewable energy options, energy usage, GHG emission attribution, and Renewable Energy Certificate (REC) allocations among the colo owners and users. Creating this structure requires collaboration, a topic we address later in this paper.

Through sharing these best practices and outlining issues that require additional resolution, the Future of Internet Power intends to bolster the ambition and implementation of renewable energy at colos. The practices outlined in this paper are specified for colo owners, colo users, and opportunities for joint efforts. The proposed solutions are neither exhaustive nor perfect, and the content aims to strike a balance between varying levels of renewable energy understanding and procurement sophistication.

TERMINOLOGY

A **colocation (colo)** is a multi-tenant retail data center facility that provides space, reliable power, cooling, and physical security for server, storage, and networking equipment.

Colo users are companies that enter into a contract agreement with the colo owner for a specific amount of space within and services from the facility.

A **Power Purchase Agreement (PPA)** is a contract between an electricity generator and a user to purchase electricity for a specified price and timeframe.

A **Renewable Energy Certificate (REC)** provides documentation for the generation of a unit (typically a megawatt-hour) of renewable energy. RECs represent the non-energy attributes of renewable generation that may be sold separately from the energy itself.

²American Business Act on Climate Pledge: www.whitehouse.gov/the-press-office/2015/07/27/fact-sheet-white-house-launches-american-business-act-climate-pledge

Best Practices for Colo Owners



Engage Users and Provide Robust Renewable Options

In addition to the leadership the technology sector has demonstrated by setting ambitious sustainability goals,³ numerous other large, data-intensive companies have made commitments to using renewable energy.⁴ Colo users exemplify this growing trend as they seek **reliable, affordable, and clean energy sources** for their IT operations, which includes the power used at the colo facilities where they are tenants. Colo owners that can provide their customers with robust renewable energy options can positively differentiate themselves in a crowded, increasingly competitive market.

How can owners get a better idea of what renewable options to provide to their users? First and foremost, many large colo users (*and* owners), have made their requests for renewables very clear in the six principles of the **Corporate Renewable Energy Buyers' Principles**.⁵

1. Greater choice in procurement options
2. More access to cost-competitive options
3. Longer and variable-term contracts
4. Access to new projects that reduce emissions beyond business as usual
5. Increased access to third-party financing vehicles as well as standardized and simplified processes, contracts, and financing for renewable energy projects
6. Opportunities to work with utilities and regulators to expand choices for buying renewable energy

While these principles represent the key interests of renewable energy buyers, colo owners should seek specification from their users in order to better understand customer preferences, expectations, and renewables interests. One way of engaging colo users is to survey existing customers to gain insights into energy interests and goals. Proactively engaging with users is not only a good way to understand their needs, but also provides an opportunity to discuss renewable energy options, costs, benefits, and challenges.

What makes for a robust renewable energy option? One area to consider is the quality of the RECs. Customers are increasingly asking for the RECs and energy generated from a renewable project to be bundled—so the local utility has to buy both the power and the certificates⁶—thereby increasing the power project's regional impact. Conversely, offering to purchase unbundled RECs in the name of a colo user for a short period of time does not have a direct impact on the local grid nor does it encourage new, additional renewable power projects.

³ Lauren Hepler, "Can Silicon Valley Sell Big Business on Climate Action?" GreenBiz, June 26, 2015, www.greenbiz.com/article/can-silicon-valley-sell-big-business-climate-action.

⁴ RE100 Signatories, <http://there100.org/companies>.

⁵ Corporate Renewable Energy Buyer's Principles, <http://buyersprinciples.org/principles/>.

⁶ Luke Hagedorn, "All RECs are not created equal: Bundling and Geographic Sourcing," Renewable Energy Law Insider, March 7, 2011, www.renewableenergylawinsider.com/2011/03/07/all-reecs-are-not-created-equal-part-1-bundling-and-geographic-sourcing/.

Focus on Additionality and Locality

Technology companies and other large colo users are becoming more and more sophisticated in their approaches to sustainability and methods for reaching renewable goals.⁷ Given the challenges associated with meeting varying user needs and levels of familiarity with renewables, colos should focus on two key principles that users want out of renewables: **additionality** and **locality**. Colo users want renewable projects to be new and additional, providing clean power to the grid in the same region of the colo facility's operations (with regions further defined by the independent system operators of electricity grids).

However, difficulties can arise when trying to balance and achieve both of these paramount principles. Different variables—including the utility power mix provided to the colo facility, a colo user's primary business location, renewable power infrastructure costs, potential system generation capacity, and regional policies—make it difficult to realistically and cost-effectively meet all expectations for a truly additional and local project. In order to manage the competitive pull of both principles, colos should gauge the benefits of each principle and decide how to strategically and innovatively approach renewable projects that are most appropriate for each user's and owner's situation.

Power Regional Portfolios

Instead of having an on-site solar or wind system for a single facility—which would likely be too small to have any significant impact—colos may mitigate the risk of changes in energy load at one building by having an off-site Power Purchase Agreement (PPA) that can support multiple facilities in a similar region. Furthermore, by purchasing renewable energy en masse for multiple colo facilities rather than for a single facility, colo owners will benefit from economies of scale.

Utility green power programs can also serve as an economical way to acquire renewable power. Costs vary among regions, so colo owners can target certain states and build facilities in areas with good green tariffs and renewable-friendly programs (such as Portland General Electric's Green Source program,¹⁰ where Infomart Data Centers operates in Oregon, or in Texas where wind power is inexpensive¹¹).

COLO OWNER EXAMPLES: EQUINIX AND SWITCH

Equinix, a leading colo provider, signed a power purchase agreement (PPA) with SunEdison for 105 MW of new solar power from the Mount Signal Solar II project located in California. The project will generate 300,000 megawatt-hours (mWh) per year, enough to cover 100 percent of Equinix's California data center and office load. With this purchase Equinix will increase its use of renewables from 30 percent to 43 percent globally.⁸

In January 2016, colo provider **Switch** announced all of its SUPERNAP data centers are powered by 100 percent renewables. Switch worked closely with the local utility, NV Energy, and the NV Public Utilities Commission to develop a green tariff that powers Switch's operations with the state's while the company awaits completion of two new solar systems—totaling 180 MW—that they've commissioned First Solar to construct in 2016.⁹

⁷ Rocky Mountain Institute, "Corporations Set Renewable Energy Record, Surpass 2 GW in 2015," November 17, 2015, http://blog.rmi.org/blog_2015_11_17_corporations_set_renewable_energy_record_surpass_2_GW_in_2015.

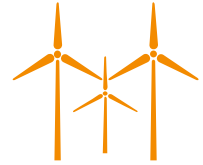
⁸ David Renard, "Equinix Goes All-Solar in California in Big Step Toward 100% Renewables," September 25, 2015, <https://blog.equinix.com/2015/09/equinix-goes-all-solar-in-california-in-big-step-toward-100-renewables/>.

⁹ Switch, "Switch Starts 2016 As The World's Largest Colocation Data Center To Be 100% Green," January 5, 2016, www.supernap.com/news/switch-largest-data-center-100-percent-green.html.

¹⁰ NREL, "Top Ten Utility Green Power Programs," <http://apps3.eere.energy.gov/greenpower/markets/pricing.shtml?page=3>.

¹¹ Clifford Krauss and Diane Cardwell, "A Texas Utility Offers Nighttime Special: Free Electricity," *The New York Times*, November 8, 2015, www.nytimes.com/2015/11/09/business/energy-environment/a-texas-utility-offers-a-nighttime-special-free-electricity.html.

Best Practices for Colo Users



Keep Renewables on the Negotiation Table

Companies seeking colo space should clearly state both efficiency and renewable energy needs early in the procurement process, such as in the RFP. Internal sustainability and procurement teams must be aligned so that renewable energy is among the key criteria for discussion in initial contract negotiations. As colo lease terms are typically 3-5 years, colo users may also consider reopening clean power negotiations at the time of contract renewal. Additionally, companies can initiate renewables negotiations when consolidating their IT infrastructure needs into fewer facilities, as this encourages colo owners to meet users' renewable needs in order to execute larger lease deals.

Leverage Collective Influence

Colo users can leverage their collective influence through either individual company-led leadership efforts that proactively reach out to neighboring colo tenants, or by seeking the support of third parties to help convene colo users (such as the NGOs that make up the Corporate Renewable Energy Partnership¹²).

Large and high-profile colo users, such as data-intensive technology companies, can play an influential role in working with their smaller colo tenant neighbors to collectively and respectfully approach the colo owner with a request for cost-effective and high-quality renewable energy options. Although some users are hesitant to identify themselves within a facility, raising awareness among occupants and working together can be done in a way that respects the privacy of companies, for instance by utilizing tenant-identification services provided by a colo owner.

While private dialogues among a group of users and the colo owner can be a good way to demonstrate shared interests, making a public joint statement among users may further influence the colo. For example, in June 2015, 19 companies that use Amazon Web Services (AWS) for cloud computing signed a joint letter,¹³ praising AWS for its 100 percent renewable energy commitment while also challenging the provider to take additional action that will give customers “full confidence in AWS’ commitment” through transparency on energy usage and renewable strategies.

COLO USER EXAMPLE: ETSY

When Etsy, the online marketplace, was looking to lease space with a new colo, it made renewables a priority in contract negotiations with CoreSite. While the details of the contract terms are confidential, Etsy signed a multi-year contract in which CoreSite committed to acquire electric power for Etsy’s operations that is generated entirely from renewable energy sources within 4 years. By making renewables a binding priority with Etsy, the colo is incentivized to retain Etsy’s operations and seek solutions that fit customer needs.

¹²The Corporate Renewable Energy Partnership is comprised of BSR, RMI, WRI and WWF: <http://buyersprinciples.org/about-us/>.

¹³Joint Customer Letter to AWS, www.greenpeace.org/usa/wp-content/uploads/2015/06/AWS-Customer-Letter.pdf?53ea6e.

Best Practices for Colo Owner-User Collaboration



Influence the Market with an Ambitious Public Commitment

While most all large companies have sustainability goals that are shared in annual reports, many companies are hesitant to **make a public commitment to using one hundred percent renewable energy** to power operations, primarily out of concern over the feasibility of reaching such an ambitious goal, given the complexities that come with navigating the energy industry. However, elevating internal goals to public declarations further strengthens the market demand for renewable energy solutions that can create significant momentum: Public, ambitious commitments signal to the market that there is a need for renewables, which creates competition among colo owners to meet user needs through high-quality renewable products, encourages utilities to provide good green tariffs, and can pressure policymakers to pass pro-renewable energy legislation.

As of January 2016, 18 information communication and technology (ICT) companies have made public commitments to using 100 percent renewable energy to power operations.¹⁴ This ambition and call to action can be shared by both colo owners and users, as demonstrated in public declarations by Adobe, Autodesk, Digital Realty Trust, Equinix, Facebook, Salesforce, and Switch. The RE100 campaign, an initiative supported by We Mean Business,¹⁵ provides another public platform for companies in all industries to share their energy plans and contribute to this growing movement.

Socialize Renewable Energy

One of the most common challenges faced by both colo owners and users is socializing the business case for and benefits of renewable energy, thereby demystifying how it works and making renewables a more approachable consideration. The variety of options (PPAs, RECs, carbon offsets), complexity of accounting, lack of transparency on existing power deals, and long-term PPA contracts that don't coincide with short-term colo user contracts can all make it challenging for senior leadership to understand and support the case for clean energy. Moreover, while recent studies debunk myths and previous concerns about renewables' costs, reliability, and capacity, misconceptions about wind and solar still linger and can also make it difficult to get buy-in from company leadership.¹⁶ The following tactics can help both colo owner and user companies to overcome internal obstacles through targeted efforts:

- » **Know what's feasible:** Colo users making requests for renewable energy solutions need to be aware of what is feasible and work the colo owner on practical solutions. A company's energy load, location of business operations, state energy regulations, and regional utility tariffs all cause variations in renewable options, costs, and impacts, which can make meeting requirements for

¹⁴ Information technology companies with public commitments to renewable energy are: Acer, Adobe, Autodesk, Amazon, Apple, BT, Box, Digital Realty, Equinix, Facebook, Google, Infosys, LinkedIn, Microsoft, Rackspace, Salesforce, SAP, and Switch. Refer to company-specific public sources for more information.

¹⁵ We Mean Business and the RE100, www.wemeanbusinesscoalition.org/action/re100.

¹⁶ NREL, "Wind and Solar on the Power Grid: Myths and Misperceptions," May 2015, www.nrel.gov/docs/fy15osti/63045.pdf.

affordable, local, and additional clean power challenging. Colo owners and users need to be innovative and flexible when exploring renewable options.

- » **Educate renewables across all business units:** Socialize renewable energy information among internal teams to cultivate champions across different departments (Operations, Legal, Finance, etc.). This can include both formal and informal levels of engagement, through requesting meetings with the CFO to using internal social networking tools to seed information over time.
- » **Be pragmatic and persistent:** Identify the right spokesperson, one who has credibility and frequent access to the top decision-maker. Educate about the available renewable options and demonstrate financial gains or cost neutrality between renewables and the status quo. Additionally, raise awareness of key customers, peers, and competitor interests in renewable energy goals.
- » **Generate top-down impact:** Encourage dialogue between C-suite leaders of both the colo user and owner companies. Colo owner sales teams and colo user procurement teams can initiate a dialogue, but senior-level engagement during contract negotiations will more effectively drive solutions for finding a renewable energy option that fits customer needs while strengthening customer loyalty.

Pilot New Opportunities for Shared Benefits and Risk

One of the main difficulties for colo owners and users looking to enter a PPA together is inconsistency among the long-term PPA contract (10-20 years) and the short-term contract (3-5 years) between colo users and owners. **One common thought among colo users is that colo owners should be solely responsible for executing PPA deals** (and taking on the associated risk). Below are some exploratory considerations for colo owners and users to find approaches to renewable power deals that offer benefits to both parties while mitigating risk:

- » The colo owner can work with the power developer and various colo users to identify different power buyers throughout the 10-20 year PPA contract. One idea to implement this is to have the PPA priced in different strips of years for different buyers.
- » A colo owner can enter a long-term PPA and execute subcontracts with colo users to earmark RECs based on the user's load and over a fixed period of time.
- » A colo owner can enter a long term PPA with a third party, such as a bank or insurer that is willing to take on the risk of the PPA in the latter years.
- » Colo users can enter longer-term leases with the colo owner, matching the length of a colo-contracted PPA, as when a colo owner signs a 10-year wind PPA contract and the colo user signs a 10-year service contract.
- » Colo users in the same facility can band together and agree to enter into longer lease agreements, thereby aggregating their load so it's equivalent to a decent-sized renewable project, around 10MW or greater. This could incentivize a colo owner to pursue a PPA of equivalent magnitude, thus serving the needs of multiple customers who are typically not large enough to justify a single, local PPA on their own.

Engage with Utilities and Advocate for Renewables Policies

Colos owners and users alike are seeking **more choice** when it comes to energy options, especially since in some regional markets PPAs are extremely difficult or even illegal. Given the diverse landscape of grid energy mix, generation capacity, project costs, and utility tariffs among the nation's regulated and de-regulated energy markets, it can be overwhelming to pursue energy advocacy efforts. This same level of complexity in the energy landscape, coupled with a relative lack of resources to pursue policy advocacy, makes taking action alone an overwhelming prospect to any company.

However, working together to engage with utilities and state regulators through targeted advocacy can help improve the renewable energy options. Data centers continue to grow,¹⁷ and colos are large energy buyers with a predictable, steady load, making them influential utility customers. As users of these colo data centers, high-profile companies can join their colo owners to demonstrate a united front that amplifies advocacy for renewable energy.

While these advocacy efforts take time to yield results, colo users and owners should still strive to seek renewables solutions even when operating in restrictive markets. Fortunately, there are upcoming opportunities for engagement that colo users and owners should consider as states address utility resource plans and compliance with the new national Clean Power Plan.¹⁹

COLO OWNER-USER COLLABORATION EXAMPLE: DOMINION POWER

In late 2015, eleven companies filed a joint letter¹⁸ to Dominion Power, advocating for the increased use of renewable energy as the utility prepares its 15-year energy planning process. As Dominion provides power to the popular data-center state of Virginia, this engagement opportunity aligned the interests of both colo owners and users that want reliable, affordable, and clean energy.

¹⁷ Yevgeny Sverdlik, "Switch Claims Reno Site Will be World's Largest Data Center," Data Center Knowledge, September 22, 2015, www.datacenterknowledge.com/archives/2015/09/22/switch-claims-reno-site-will-worlds-largest-data-center/.

¹⁸ Letter from Dominion Large Energy Buyers to Virginia SCC, www.scc.virginia.gov/docketsearch/DOCS/34yj01!.PDF.

¹⁹ U.S. EPA, "Fact Sheet: Renewable Energy in the Clean Power Plan," October 16, 2015, www.epa.gov/sites/production/files/2015-11/documents/fs-cpp-renewable-energy.pdf.

Onward: Energizing a Colo Owner-User Partnership for Innovation

By sharing these best practices and exploratory concepts, the **Future of Internet Power encourages ambition and dialogue among colo owners and users as both parties look to further align and achieve bold renewable energy goals**. As data-driven businesses continue to grow, so does the urgency to find large-scale, sustainable solutions to powering the digital information that we so heavily rely on. The case for using renewable energy to decrease GHG emissions and mitigate climate change is now clearer than ever before, as demonstrated by the COP21 climate agreement²⁰ in Paris. Those working with energy-intensive data centers, including colo owners, users, power developers, and utilities, are well-positioned to make a positive contribution by maximizing the use of renewable energy.

As stated at the outset of this paper, in addition to collaborating on efforts to procure renewables, **a more systemic approach needs to be established to:**

- 1) Track colo users' IT energy usage within their spaces, plus energy usage as a facility tenant
- 2) Link renewable energy to specific users as a percentage of total energy usage
- 3) Clarify the GHG emissions that are associated with the colo and user (scope 2 and 3)
- 4) Determine the allocation of RECs between the colo and user.

Developing a widely recognized approach that addresses these issues—in parallel to the ongoing pursuit of procuring renewables—must be done collaboratively and can, if successful, result in a more functional, standardized approach that would increase the ease and encourage the scaling of renewables at colo facilities.

As outlined in this paper, colo owners and users can each approach the challenges to maximizing renewables by addressing areas that are within their own control and by working collaboratively to explore innovative partnerships. Given the dynamic environment of the energy industry and the fast rate of technological advances in renewable energy solutions, there is a significant opportunity for colo owners and users to demonstrate leadership and influence that will help make the use of clean power more accessible and affordable.

We welcome feedback and look forward to continuing this conversation on advancing renewables at colos with all stakeholders in 2016.

²⁰ United Nations, "Historic Paris Agreement on Climate Change: 195 Nations Set Path to Keep Temperature Rise Well Below 2 Degrees Celsius," December 12, 2015, <http://newsroom.unfccc.int/unfccc-newsroom/finale-cop21/>.

Appendix

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About BSR

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