Green Web Hosting

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Introduction

Data centers are central to the operations of many companies, especially those that operate on the web. A frequently overlooked aspect of data center operations is the environmental effect of the electricity that powers this equipment.

Simply put, data centers use a significant amount of energy: Analytics Press estimates that data centers used 1.3% of global electricity in 2010 and 2% in the United States. *The New York Times* claims that as a result of inefficient operation, "data centers can waste 90 percent or more of the electricity they pull off the grid."

Manoverboard commissioned Third Partners to produce an assessment of the environmental merits of several hosting and data center providers. Manoverboard is a web design and development firm based in Winnipeg that is also a Certified B Corporation. According to the nonprofit B Lab that runs the certification program, "B Corps are certified to meet rigorous standards of social and environmental performance, accountability, and transparency." Manoverboard needed to better understand its options for itself and its clients in evaluating the environmental performance of its web-based business.

Methodology

Manoverboard identified a select list of ten hosting providers relevant to their operations. *Please note that this is not a comprehensive list of hosting providers or of all possible sustainably-minded hosting providers.*

Each hosting provider was assessed on the following areas of environmental performance. Please refer to the last page of this report for a table that includes a side-by-side comparison of each hosting provider based on these performance areas.

Energy Generation

- Energy mix of the local electricity grid. In nearly every case, data centers draw electricity from the local electricity grid, which consumes power produced by the mix of different types of power plants in its area (e.g. coal, natural gas, nuclear, hydro, oil, wind, solar, etc.). Even for most data centers with on-site or off-site renewable energy, the center maintains a tie to the local electricity grid and the power its equipment uses is from these grid-fueled power plants. This local electricity mix can rely heavily on fossil fuels that produce greenhouse gasses (GHGs).
- Low-GHG Grid % is the percent of the grid that is supplied by power plants that produce zero or low-GHG power, defined as wind, solar, hydro, and nuclear. This is not "consequence-free" power—no energy production method is—but this metric helps assess how much the data center's consumption of grid power contributes to climate change.
- Emission Factor of the local grid is based on the energy mix identified above, and is defined as the pounds of carbon-equivalent GHGs produced by the consumption of one kilowatt-hour of power (kWh). It is a primary building block of understanding the climate change impact of electricity use.
- Clean Energy
    - 100% On-site renewable energy on a microgrid is the most preferable method of clean energy as it does not rely on grid power or any other fossil-fuel power to produce electricity and power the data center. However, the economics and mechanics of these types of installations are tricky, so it is not a common setup. But the benefit of it is that buildings that produce their own energy locally do not end up producing line and transmission losses.
    - On-site renewable energy contributing power to the grid is the next best alternative, and is significantly more common than the first option. In this scenario, electricity generated on-site by solar panels or wind turbines is quantified and fed back into the grid to be consumed by the grid's customers (of which the data center is a part). This is less preferable than a microgrid because it produces power loss through transmission, but it is significantly better than simply consuming grid power.
    - Off-site renewable energy, or participation in a Renewable Energy Credit (REC) market, indicates a data center's commitment to renewable energy in the area of its operations. RECs displace the local production of fossil fuels by financing renewables

locally. This is not quite as beneficial as on-site renewable energy due to more significant transmission losses over longer distances, but is still highly preferable to no REC or offset policy.

- Purchase of Carbon Offsets is the last strategy, and involves the purchase of credits or offsets on a carbon market, the credit being a quantity of GHGs that are abated by a specific project undertaken locally or in another area of the world. This is less preferable than RECs and on-site renewables because it can lead to unscrupulous projects that provide questionable benefit in addition to a dissipated project results. However, it is still significantly better than no renewables policy or offset strategy.

Energy Efficiency

- A key metric in understanding data center performance is Power Use Efficiency (PUE), which is the ratio of total electricity consumed in a data center facility relative to the electricity consumed only for computing power. The lower the metric—which has a theoretical minimum of 1—the less energy is required for cooling and ancillary facility functions, indicating a more efficient data center. For example, a PUE of 1.1 indicates that 1/1.1 = 91% of the energy consumed in a data center was used for computing, and the remaining was for cooling and other facility requirements. In a survey from the Uptime Institute, the average self-reported PUE for data centers in 2014 was 1.7. A hosting provider with a self-reported and public PUE is preferable to one without, and a PUE that is lower is preferable to a PUE that is higher.
- Due to the waste heat generated by server operations, air conditioning is often significant energy expense. Data centers that use energy efficient cooling methods such as passive ventilation, hot/cold aisles, or other innovative cooling methods are preferable as it inevitably increases the efficiency of operations. Location also plays a significant role: operating a data center in Phoenix is significantly costlier from a cooling standpoint than operating a data center in Montreal, all things being equal.
- Other Energy Efficiency practices include energy monitoring systems, energy efficient lighting, solar tubes, ensure that the expected electricity usage of equipment is aligned with actual electrical consumption, etc.

Other Considerations

- Sustainability Policies & Corporate Commitments that are not essential to data center operations but increase the sustainability of the company are indicative of a company's commitment to the environment.
- Certifications & Awards are significant, especially if they are data center or green building certifications, such as LEED and Energy Star.
- Energy-Efficient Equipment indicates that the equipment used meets the latest standards in energy efficiency, which decreases overall power consumption and GHG emissions. Energy Star is the most common label in North America for this type of equipment.

- Procurement practices and e-waste are significant because e-waste is an emerging environmental concern. Companies should pay close attention to the amount of e-waste created by the procurement of new servers, and should take steps to verify discarded equipment is either reused or recycled properly. 50 to 80% of e-waste—including e-waste that is sent to unscrupulous "recyclers"—is inappropriately processed by impoverished communities in the developing world, effectively creating a negative environmental impact arguably worse than if it were simply landfilled as-is.
- Backup systems & generators most commonly run on fossil fuels, so it is important to note the fuel source and amount of use.

Results

Data centers were assessed based on the above impact areas and rated based on publically available information. They are ranked into the following five categories. Please refer to the last page of this report for a table that includes a side-by-side comparison of each hosting provider based on these performance areas.

One Star - Hosting with No Green Strategy

- MediaTemple appears to have no sustainability policy, or at least it is not published on its website. Its grid power is twice as clean in its El Segundo office than in Ashton, VA. But without RECs, offsets, energy efficiency strategies, or a sustainability policy, there is no net benefit to using Media Temple from a sustainability standpoint. The company should work to develop a sustainability impact assessment and a development plan on how to reduce its footprint. A list of suggestions is found on page 7.
- Host Papa appears to have no sustainability policy, or at least it is not published on its website. Its operations are near Toronto, Canada, which has a relatively low-GHG grid, which slightly makes up for its lack of a clear policy. Similar to MediaTemple, Host Papa could do much more to clarify a sustainability policy and reduce its environmental impact, and would benefit from implementing an impact assessment and reduction plan and follow the suggestions on page 7.

Two Stars - Carbon-free

- Green Geeks is an overachiever in its purchase of offsets, purchasing three times its energy use in Renewable Energy Credits from wind energy plants. This does help compensate for the dirty electrical mix of both Chicago and Phoenix where its data centers are located. Green Geeks is certainly more sustainable than those in the one-star category, but it does not adequately communicate any strategy beyond its purchase of RECs. E-waste, energy efficiency, and the communication of meaningful policies for continual improvement are important.

Three Stars - Carbon-free, green commitments, unknown energy performance

- pair Networks offsets 100% of annual use, plus select Scope 3 emissions.[1] It also has installed energy efficient lighting, has policies to purchase energy efficient servers, and reuses and recycles its retired equipment. It appears to have a strong commitment to the environment, but its 3-star rating here is due to its lack of concrete data on the energy performance of its equipment.

[1] GHG emissions are commonly divided into three scopes. From the GHG Protocol:
- Scope 1 emissions are direct emissions from owned or controlled sources.
- Scope 2 emissions are indirect emissions from the generation of purchased energy.
- Scope 3 emissions are all indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions.

- Ethical Hosting benefits from the same low-GHG grid of Toronto as Host Papa, and adds a clear sense of social good to its hosting offering. It donates 10% of its pre-tax profit to social good charities, and uses Energy Star equipment in an energy-efficient facility. To improve its score, more information on cooling methods and PUE would clarify its true environmental impact.
- Canvas Host is a hosting provider that appears to have a significant organization-wide commitment to sustainability. It is an Oregon Benefit Company, a B Corporation, and is certified by Sustainability at Work, Green America, and as an EPA Green Power Partner. Similar to Ethical Hosting, Canvas Host should communicate its PUE and cooling methods, which would significantly help in assessing its environmental performance.

Four Stars - Carbon-free with strong energy performance

- Green House Data is also a B Corporation that has an average PUE of 1.25 across its four data centers, with its best performing center at 1.14. It uses hot/cold aisle containment, free cooling from outside air, is an EPA Green Power Partner, operates Energy Star equipment, and offsets 100% of its annual electrical use with renewable energy. Its PUE of 1.25 can be improved, and because select providers in the next category have a better PUE, it remains in the four-star category.

Five Stars - Carbon-free with Outstanding energy performance

- Bend Broadband Vault is an excellent provider with on-site solar that provides up to 16% of the energy needed to run its operations and a PUE of 1.1. Additionally, it capitalizes on outside air to cool for free 75% of the time. It operates hot/cool racks, uses energy efficient lighting, a low-energy flywheel, and is based in a LEED Gold and EPA Energy Star facility. One point of clarity would help: it does not disclose whether it purchases RECs for the remaining 84% of power it uses. Even so, its performance is outstanding and accordingly it is in the top tier of this assessment.
- iWeb is a unique provider from Montreal, QC. It relies on low-GHG power from hydroelectric providers in Quebec, which effectively negates the need for solar or other renewable power use. It has high standards on e-waste and optimizes its server energy use. Due to its cool climate, it operates with free cooling for much of the year, and when it must use air conditioning equipment it relies on a Liebert DSE System which exceeds the ASHRAE minimum standard by 53%. It does not provide a PUE, which would be interesting to know.
- AISO.net is 100% served by renewable energy in its Romoville location. It has a PUE of 1.14 and uses a latent cooling method for its air conditioning that prevents it from using any refrigerants. It has installed solar tubes for lighting, rainwater catchment on its campus, and even a green roof over its facilities. It is planning to add wind power to its array of renewable energy, and appears to have an aggressively sustainable growth strategy.

Recommendations for Hosting Customers

From an environmental perspective, Third Partners recommends any of the hosting providers in the four-star and five-star groups. Manoverboard and its clients should look to select one of these providers, assuming there has been an additional assessment of the provider's development platform, pricing and data plans, customer support, and technical qualifications which are not included in the scope of this study.

Recommendations for the Greening of Hosting providers

As a result of this analysis, we believe it would be helpful for hosting providers to pursue the following recommendations when looking to build more sustainable business practices.

1. Calculate and communicate your PUE, identify steps to reduce it, and develop an implementation plan.
2. Calculate your energy use over a given year, and determine whether you can install renewable energy on your property. If so, find an installer and work through the financing options, paying attention to the ROI of any proposal. If on-site renewables are not an option, purchase RECs from your power provider. If that is not an option, seek carbon offsets or credits from a Gold Standard provider. Make sure you communicate the percent of your power that is offset by either RECs or carbon credits; simply stating you purchase them is not enough to provide clarity into your practices.
3. Perform a facility energy audit to identify opportunities.
4. Hot/cold rack orientation with properly installed cooling sources can dramatically reduce electricity consumption for cooling.
5. Establish new data center locations in cooler climates, such as the Pacific Northwest, Upper Midwest, Canada, or Scandinavia. Perform a survey of energy providers to understand how clean or dirty the grid is in any new data center location.
6. Consider running backup generators on biodiesel.
7. Publicize your efforts. Do not greenwash; however it is important that your efforts present a clear sustainability strategy and prioritize, above everything else, honesty and full disclosure.

Please note: This study is an evaluation of providers based only on environmental performance. It does not take into consideration the costs, data performance, or technical support of hosting providers. While we stand behind these recommendations, they do not represent an official or unofficial endorsement of these vendors' services. Thank you for working sustainably.

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	MediaTemple	Host Papa	Green Geeks	Pair.com	Ethical Hosting	Canvas Host	Green House Data	Bend Broadband Vault	iWeb	AISO.net
Assessment Score	1	1	2	3	3	3	4	5	5	5
ENERGY CONSUMPTION										
Location	Ashton, VA El Segundo, CA	Oakville, ON	Chicago, IL Phoenix, AZ	Pittsburgh, Pennsylvania	Toronto, ON	Portland, OR	Cheyenne, WY Portland, OR Piscataway, NJ Orangeburg, NY	Bend, OR	Montreal, QC	Romoland, California
Energy Mix of local Grid	50% Natural Gas 15% Nuclear 15% Hydro 10% Renewables 7% Coal ---------- 46% Coal 38% Nuclear 11% Natural Gas	59% Nuclear 23% Hydro 11% Natural Gas 3% Wind	69% Coal 24% Nuclear 4% Natural Gas ---------- 40% Coal 33% Natural Gas 18% Nuclear 6% Hydro 3% Renewables	69% Coal 24% Nuclear 4% Natural Gas	59% Nuclear 23% Hydro 11% Natural Gas 3% Wind	44% Hydro 31% Coal 13% Natural Gas 7% Renewables 3% Nuclear	Varies	44% Hydro 31% Coal 13% Natural Gas 7% Renewables 3% Nuclear	97% Hydro	50% Natural Gas 15% Nuclear 15% Hydro 10% Renewables 7% Coal
% Renewables, Hydro, and Nuclear (low-GHG)	38%	89%	24-27%	24%	89%	54%		54%	97%	40%
Emission factor of local grid (lb CO2e per kWh)	0.67 to 1.16	0.22	1.25 to 1.58	1.58	0.22	0.92		0.92	0.15	0.67
On-site Renewable Energy	No Information	No Information	No	No	No	No	No	Up to 16% of Load	No	100%
Off-site Renewable Energy (owned installations or purchased RECs)	No Information	No Information	Purchases Wind Credits equal to 3x its own power consumption	100% of Annual use, plus select scope 3 emissions	17% of energy from RECs	100% Wind Energy	100% of Annual use	No Information	No Information	N/A (On-site)
Carbon Offsets	No Information	No Information	N/A (RECs)	N/A (RECs)	83% of energy with high-quality offsets	N/A (RECs)	N/A (RECs)	No Information	No Information	N/A (On-site)
ENERGY EFFICIENCY										
Power Use Effectiveness (PUE)	Lots of technical information, none indicate energy efficiency is a priority	No Information	No Information	No Information	No Information	No Information	1.25	1.1	No Information	1.14
Data Center Cooling Methods		No Information	No Information	No Information	No Information	No Information	Hot/cold aisle containment, Free Cooling	75% of the time, free passive cooling, Hot/cool racks	High-tech free cooling technology, Liebert DSE System which exceeds the ASHRAE minimum standard by 53%	Latent Cooling
Other Energy Efficiency Practices		No Information	No Information	Energy efficient lighting	CFL lighting, high efficiency furnace, on-demand hot water system	No Information	No Information	Smart Lighting, Flywheel UPS	Optimized server energy use	Solar Tubes, Rainwater collection, Green Roof
OTHER CONSIDERATIONS										
Other Sustainability Policies & Corporate Commitments	Lots of technical information, none on sustainability.	No Information	EPA Green Power Partner, focused on the consumer-driven side of sustainability. No clear corporate commitment aside from RECs	Policies to purchase energy efficient servers	10% of pre-tax profits to social orgs. Telecommuting, Recycled paper.	Oregon Benefit Co., B Corporation, Sustainability At Work, Green America, EPA Green Power Partner	B-Corp, EPA Green Power Partner	No Information	No Information	Excellent commitment level demonstrated by actions
Certifications & Awards	No Information	No Information	No Information	No Information	No Information	No Information	No Information	LEED Gold, EPA Energy Star,	No Information	No Information
Energy-efficient Equipment	No Information	No Information	No Information	No Information	Energy Star	Highly Efficient	Energy Star	No Information	No Information	No Information
Procurement practices and e-waste	No Information	No Information	No Information	Reuse & Recycling Plan	No Information	Reuse & Recycling Plan	No Information	No Information	High standards on e-waste	No Information
Backup systems & Generator Use	Diesel Generators	No Information	Diesel Generators	Diesel Generators	No Information	Diesel Generators	No Information	No Information	No Information	No Information