First-of-its-Kind Data Center Showcases eBay Inc.’s Commitment to Cleaner and Greener Commerce

eBay Inc. team challenged Utah state law with the passage of Senate Bill 12; Introduced Bloom Energy fuel cells and reduced its carbon footprint

In less than two decades, eBay Inc. has risen from its humble beginning as an online auction house to become a global commerce leader. In 2013, the company enabled $205 billion in commerce volume and has repeatedly demonstrated its willingness to innovate—not only in the world of commerce, but in other arenas that support its business objectives and philosophy.

eBay Inc.’s penchant for a better customer experience, along with its strong commitment to environmental responsibility, is on full display at the company’s Salt Lake City data center. As the first data center in the world to use fuel cell technology as a primary power source, the facility offers proof that a company’s concern for the environment and the bottom line can go hand-in-hand.

The Salt Lake City data center was fully commissioned and operational as of October 2013. The project includes white-space buildout, a spine building and site work to support two modular data containers, 6 megawatts (MW) of Bloom Energy Servers™ (fuel cells), a generator, uninterruptible power supply (UPS), high-efficiency cooling systems and infrastructure for future expansion to 18 MW.
New Design Paradigm

In a revolutionary break from traditional data center design, this facility’s primary power source comes from the 30 Bloom Energy fuel cells that convert natural gas into electricity through a chemical reaction. As a result, it produces approximately 49 percent fewer carbon dioxide emissions than the adjacent, Tier IV, first-phase data center that currently runs on power from the local electrical grid.¹

The Salt Lake City data center also deploys one of the densest² and one of the largest³ modular data centers in the world. It uses Dell Inc.’s new EPIC module, which packs more than 1 MW of power capacity into 24 racks, and Hewlett-Packard Co.’s EcoPOD module, which adds 1.4 MW of power capacity in 44 racks of gear.

But eBay Inc. didn’t stop there. To maximize the center’s overall energy efficiency, eBay Inc. teamed with Ormat Technologies Inc. to deliver the natural gas. This partnership will create an off-site waste heat recovery solution at the natural gas compressor station to provide up to an additional 5 MW of cleaner power.

“Our initial results show reliability, availability and sustainability,” said Dean Nelson, vice president of eBay Inc.’s Global Foundation Services. “This project was half the cost of the first phase and half the carbon footprint. The use of fuel cells has increased the availability in the design due to their power generation reliability and availability.”

Challenging Convention

For eBay Inc., the Salt Lake City project reflects a corporate philosophy to continually challenge convention and break new ground, whether in pioneering online alternatives to brick-and-mortar commerce or developing new paths to sustainable development. Along with helping reduce its carbon footprint, the facility also helps fulfill eBay Inc.’s goal for increased reliability in the mission critical environment by reducing its dependence on the sometimes unpredictable conventional power grid.

“Many companies would be afraid to get outside of the standard data center box,” commented eBay’s Director of Mission Critical Engineering, Mike Lewis. “For us, it’s exciting to be part of something like this and to do things that nobody’s done before.”

Changing the Regulatory Environment

The need for a cleaner power source wasn’t as high on the priorities list six years ago when eBay Inc. decided to expand into the state of Utah due to its skilled available workforce, high quality of life and other business advantages. As eBay Inc.’s data center expansion needs grew, however, finding an alternative to Utah’s coal-intensive grid electricity became a priority. The company is committed to reducing its overall carbon footprint. In 2013, eBay Inc. set a goal of obtaining at least 8 percent of its energy from cleaner sources by 2015.

Recognizing the need to change the regulatory environment, eBay Inc. was instrumental in helping pass Utah’s Senate Bill 12, which was signed into law in March 2012. The bill allows non-utility companies like eBay Inc. to invest in and purchase power directly from renewable energy sources.

Bringing Together the Team

In the summer of 2012, eBay Inc. issued a unique open source design Request for Proposals (RFP) that elicited dozens of innovative design proposals worldwide. eBay Inc. selected Winter Street Architects as the designer. Like DPR, the firm was involved in eBay Inc.’s modular data center in Phoenix, which was completed in 2012. In December 2012, eBay Inc. put out another RFP and selected DPR as the contractor for the first phase of the Salt Lake City data center.

DPR’s relationship with eBay Inc. dates back nearly a decade. DPR’s Tom Maples said eBay Inc. data centers are always challenging and generates a true team effort that produces cutting edge solutions and industry leading energy efficiency.


² According to Dell, eBay Inc. is deploying the world’s densest modular data center (called EPIC), which has 24 rack positions and 1 Megawatt of power, the Dell EPIC is the densest modular data center in the world.

³ According to HP, eBay Inc. is deploying the world’s largest modular data center, with 44 rack positions and 1.4 Megawatts of power, the HP EcoPOD is the largest modular data center in the world.
Despite extensive data center experience shared by all of the team members, the Utah data center project represented uncharted territory. The challenges of designing and building something no one had ever done before demanded every bit of mission critical data center experience, knowledge and out-of-the-box thinking that this high-performing team could deliver.

DPR’s John Arcello said that in addition to mastering an entirely new technology, the team also faced the challenge of assimilating individuals from many different offices and regions into a cohesive unit. Design and construction team members came from Phoenix, Salt Lake City, San Jose, San Diego, Los Angeles, Denver, Boston, Raleigh, Austin and Atlanta to the Salt Lake City jobsite.

“We all had to come together in lightning speed to become a high-performing team on a very fast-paced project. The freight train was moving,” Arcello noted. “The geographical differences were a unique aspect of the job and required a lot of online meetings and collaboration. It was a challenge to get it running seamlessly—but ultimately, we were successful.”

The Path to a Cleaner, Greener Solution

The initial design solution featured primary utility power backed by generators and UPS. But eBay Inc. was already looking for a cleaner and greener power solution that advanced its vision for a more environmentally sustainable future.

The team was also looking for a solution through the lens of eBay Inc.’s soon-to-be-adopted Digital Service Efficiency metric that measures and seeks to increase the efficiency of every digital service provided to its customers. The metric quantifies the number of business URL requests that are completed per kilowatt-hour of energy consumed. “Commerce is what eBay Inc. is all about,” Nelson said. “Data centers are the engines, and we have to make sure they’re running as efficiently and cost-effectively as possible.”

As the Utah project team began to research options to increase reliability, efficiency and sustainability through alternative power sources, fuel cell technology quickly rose to the top of the list.

“We began to take a close look at fuel cell technology to explore how reliable it is, what its capabilities are and how we could architect a completely new data center and serve our needs for...
time and availability,” Lewis said. “The biggest challenge we faced was integration of this technology to power our entire data center. Nobody in the world had done this before. The engineering and architecture of an entirely new system was a major hurdle.”

Where other owners might have seen an insurmountable obstacle, eBay Inc. saw an opportunity for innovation. Even so, it took a remarkable leap of faith for the company to commit to the new, untested technology in a mission critical environment that requires uninterrupted power 24/7.

Taking that leap of faith and tuning the dial on digital efficiency with the use of the new fuel cell technology has already delivered “many, many benefits,” according to Nelson, who said the Salt Lake City facility has exceeded expectations since it went online late last year. “It’s a better mouse trap,” he said simply. “By implementing a design like this we’ve been able to ‘move the needle’ as we’re measuring the increased efficiency of each transaction for our business.”

**Tackling Additional Challenges**

Along with the major issues of integrating the new technology and bringing together a geographically diverse team, the project brought a myriad of other challenges. Among them:

- Delivering the ground-breaking project in record time. Construction began in September 2012 and was completed just 10 months later in July 2013. The facility was fully commissioned in October 2013.
- Adapting the project schedule and workflow.
- Performing extensive underground work, including placing footings and foundations and installing underground utilities, in the middle of winter in Utah.
- Helping all team members navigate the learning curve involved with understanding fuel cell technology and its associated infrastructure.
- Ensuring that work was always coordinated through building information modeling (BIM) before installation took place in the field.
- Coordinating numerous equipment changes and vendor delivery challenges.

**Key Lessons Learned**

Those challenges resulted in some valuable lessons learned by all involved. Lewis said from the owner’s standpoint, the biggest thing they might do differently would be to allot more time to integrate new technology on a project of this size and nature.

“Overall, this project was a huge win for us,” said Lewis.

Nelson added, “By challenging the status quo on how data centers have been designed for the last 30 years, we’ve yielded even bigger returns by applying a new technology as primary power. We’re now able to increase our availability for the data center, decrease our carbon footprint significantly for that data center’s power consumption, and optimize the efficiency of the generation and consumption of power onsite.”

The Salt Lake City data center marked eBay Inc.’s second Bloom installation, and Lewis points out that the solution is not right for every project, or even for every owner. “It’s not a one-size-fits-all solution,” he said. “It’s important to know what’s most important to your business and to design and build facilities that support it accordingly.”

Lewis credited the team’s flexibility and sheer determination for helping drive the successful completion of this unique facility.

“I have to hand it to the team,” Lewis commented. “I know the magnitude of the hurdles that they had to fight through with weather, equipment delivery and the like. Their ability to be flexible and to support new and different ways of doing things to get the project completed was key.”

And the single most critical factor in the project’s success? “If I had to point to one thing I would just say determination on the part of the whole team, all the way through,” he added.
**CUSTOMER:** eBay Inc. now boasts more than 149 million active buyers (as of Q2 2014) and eBay Inc. enabled $205 billion in commerce volume at the end of 2013. The company has repeatedly demonstrated its leadership in innovation, not only in the world of commerce, but in other arenas that support its business objectives and philosophy.

**ARCHITECT:**
Winter Street Architects

**ENGINEER:**
AHA Consulting Engineers

**PROJECT HIGHLIGHTS:**
- The world’s first data center with onsite fuel cells as the facility’s primary power.
- White-space buildout, a spine building and site work to support two modular data containers, 6 MW of initial Bloom Energy fuel cells, a generator, uninterruptible power supply, high-efficiency cooling systems and infrastructure for future expansion to 18 MW.
- eBay Inc. is committed to reducing its overall carbon footprint and achieving its goal of obtaining at least 8 percent of its energy from cleaner sources by 2015.