



The Value Proposition for Data Center Optimization

May 27, 2015

Today's Presenters

- Matt Gleason, CoreSite
- Steve Naumann, Social Security Administration
- Paul Santana, eBay

Matt Gleason, CoreSite



Better Buildings Summit

May 27, 2015



Who is CoreSite?

CoreSite is a national multi-tenant data center colocation provider.

Since 2001, CoreSite has focused on building secure, reliable, high-performance data center solutions supported by industry-leading customer service.

CoreSite Stats

- 350+ professionals
- 2.5 million NRSF of data center space
- 17 facilities across eight key North American markets
- 10 of our 17 facilities are committed to energy improvements for the Better Buildings Challenge



Where are We Located?



2012 – 2104 Energy Savings and PUE Improvements

- 2012 PUE for 10-site set was in the range of 1.53 – 2.37
- 2014 PUE for 10-site set was in the range of 1.31 – 1.84
- Average PUE reduction between 2012 – 2104 was 12% across 10-site set

- kWh reduction from 2012 baseline
 - 2013: 26,255,925 kWh
 - 2014: 15,730,738 kWh
 - Total kWh saved: 41,986,664



How to Reduce Energy Consumption

The first step is to accurately measure and trend PUE.



CoreSite's Better Building Challenge Engagement

Engagement Summary

- Replacement of inefficient electrical/mechanical systems
- Retro-commissioning of cooling systems and controls
- Air/water-side economization
- Customer enhancements such as hot/cold aisle containment
- Enhanced DCIM beyond BMS
- Technology improvements such as LED lighting

Implementation Method

- Internal Facilities/Construction Projects
- External/Hybrid
 - LEED Commissioning Agent
 - Energy Consultants
 - Engineering Firms

Case Study

Replaced existing chiller controls system with advanced system

- Allows for chiller operation as a whole system as opposed to individual units
- Allows for compressor rotation, limiting run-time and lowering repair costs
- System controlled by main loop temp as opposed to individual supply temperature

Retrofit data center CRAHs with VFD kits

- Allows fan speed ramp based on underfloor pressure
- System maintains same temperature while operating at ~75% less kW per CRAH unit
- Decreases wear and tear on fans and belts resulting in lower repair costs

Containment and CFD study

- When combined with the VFD retrofit, allows for removal of half of the installed perforated tiles, further limiting fan speed

Case Study, Continued

- Reduction of non-IT load (cooling)
- Able to add 250kW of IT load
- ROI does not include additional kW sold

Results

- Annualized savings of \$245,140
- Simple ROI in 1.62 years

	PUE	IT Load (kW)	Support Load (kW)	Total Load (kW)
Original	1.7	2400	1680	4080
Post-Project	1.54	2650	1431	4081
Change	9.41%	250	-249	-1

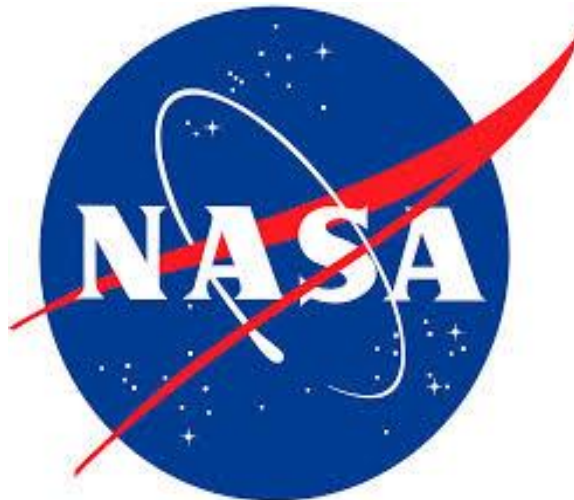
Project Costs	\$\$\$
Capital Expenses	\$457,711
Consulting Costs	\$65,000
Utility Incentive	(\$126,000)
Total Cost	\$396,711

Steve Naumann, Social Security Administration

National Support Center DOE Better Buildings Challenge May, 2015

Steve Naumann, Data Center Director
Program Manager - NSC IT Migration
Social Security Administration





SSA Data Centers



	NCC	SSC	NSC
Details			
Year Built	1979	2009	2014
Cost	\$73M	\$125M	\$297M
Size (<i>Square Feet</i>)			
Total Space	600,000	100,000	300,000
White Space	64,000	46,000	52,000
Staffing			
IT Staff	1,100	92	79
Total Staff	1,200	175	208

National Support Center Key Energy Points



- **LEED Gold Certified**
- **Uptime Institute certified Tier 3 Data Center**
- **DOE Better Buildings Challenge**
- **Hot-Aisle-Containment of IT equipment**
- **High density computing & Energy Star equipment**
- **Electric metering down to the branch circuit**
- **Convergent monitoring of IT equipment: PUE, heat maps, Smart Racks**
- **Free cooling below 55° roughly 145 days per year...~\$240k/yr**
- **Photovoltaic Solar Array 1.3MW ...~\$152K/yr**
- **6MW now, 10MW in the future**
- **Passive Solar heated water, rainwater reclamation, reduced flow fixtures**
- **Instant-on and LED lighting throughout the complex**
- **Southern facing floor-to-ceiling windows in the office building to help offset heating costs**
- **Indigenous grasses - less mowing - reduces fuel costs and air pollutants**
- **Solar powered parking lot lights**
- **Pervious parking lot and under grass grid for building maintenance access road**

Photo-Voltaic Solar Array



Data Center Optimization Management



DCOM Strategic areas:

Energy Efficiency

+ Project Management

+ IT, Facilities and Security Co-Management of Operations

All add up to cost savings



Project Management



- Full time DCOM PMO staff to guide IT teams
- Standardized run-book for HW/SW installation in the whitespace
- Development life cycle....provide guidelines; ARBs and IRBs
- All equipment in the Whitespace must have an IT Operations sponsor
- Convergent monitoring and configuration management will show underuse
- Restrict Whitespace to authorized personnel with valid CMS
 - ties back to an enterprise configuration management system...which is used for implementation planning and troubleshooting after big change weekends
- Knowledge sharing and outreach: Public and Private Sectors
- Set savings goals...and stick to them

Managing IT



- **High Density Computing/Hot-aisle-containment**

- Asset Management and RFID
- Configuration Management
- Consolidation and Virtualization....Virtual 1st!

- **Convergent Monitoring** – using real time environmental metrics to manage IT

- JBOC and JBOD....our goal
- Instant PUE and trending
- move cyclical workloads to spread the heat load evenly

- **Storage**

- Deduplication
- Virtualization
- e-vault

- **Network**

- Top-of-Rack switches
- Virtualization

Collaborative Management



- **IT, Facilities and Security Working together.... We are running an interdependent system not just a Data center**
- **Regular planning meetings help the 3 worlds understand each other**
- **Discuss workloads for better understanding and appreciation**
- **Discuss maintenance schedules**
- **Discuss threat levels (IT and physical)**
- **Dark Data Center, less people less mistakes less outages both the data and the site more secure**
 - **Encourages remote administration(SSC/NCC/NSC...one takes over for the other)**
 - **Telework, less commuting: cut down on agency's carbon footprint**

Driving Forces



- **Taxpayers!**
- **DOE / CEQ BBC**
- **FDCCI**
- **Congressional oversight**
- **FITARA...FDCOI**
- **Federal mandates, Executive Orders**
- **Tighter budget**
- **It's the right thing to do!**

Final Thought



“Eventually by standardizing and formalizing these holistic processes

.....it won't simply be a way of striving for energy savings and greening

.....but will become the new operational paradigm.”

Discussion



Data Center Efficiency

DOE

Better Building Summit

Paul Santana

May 27th 2015





eBay is one of the **WORLD'S LARGEST ONLINE MARKETPLACES** with an extensive product inventory that combines unique and interesting items with great deals on things shoppers need and love. eBay's community of global sellers includes individuals, merchants of all sizes and beloved brands. eBay's portfolio of businesses includes eBay Classifieds Group and StubHub.

- A pair of shoes sold every 2 seconds
- A women's dress sold every second
- A cell phone sold every 4 seconds
- A car or truck sold every 5 minutes via a mobile device

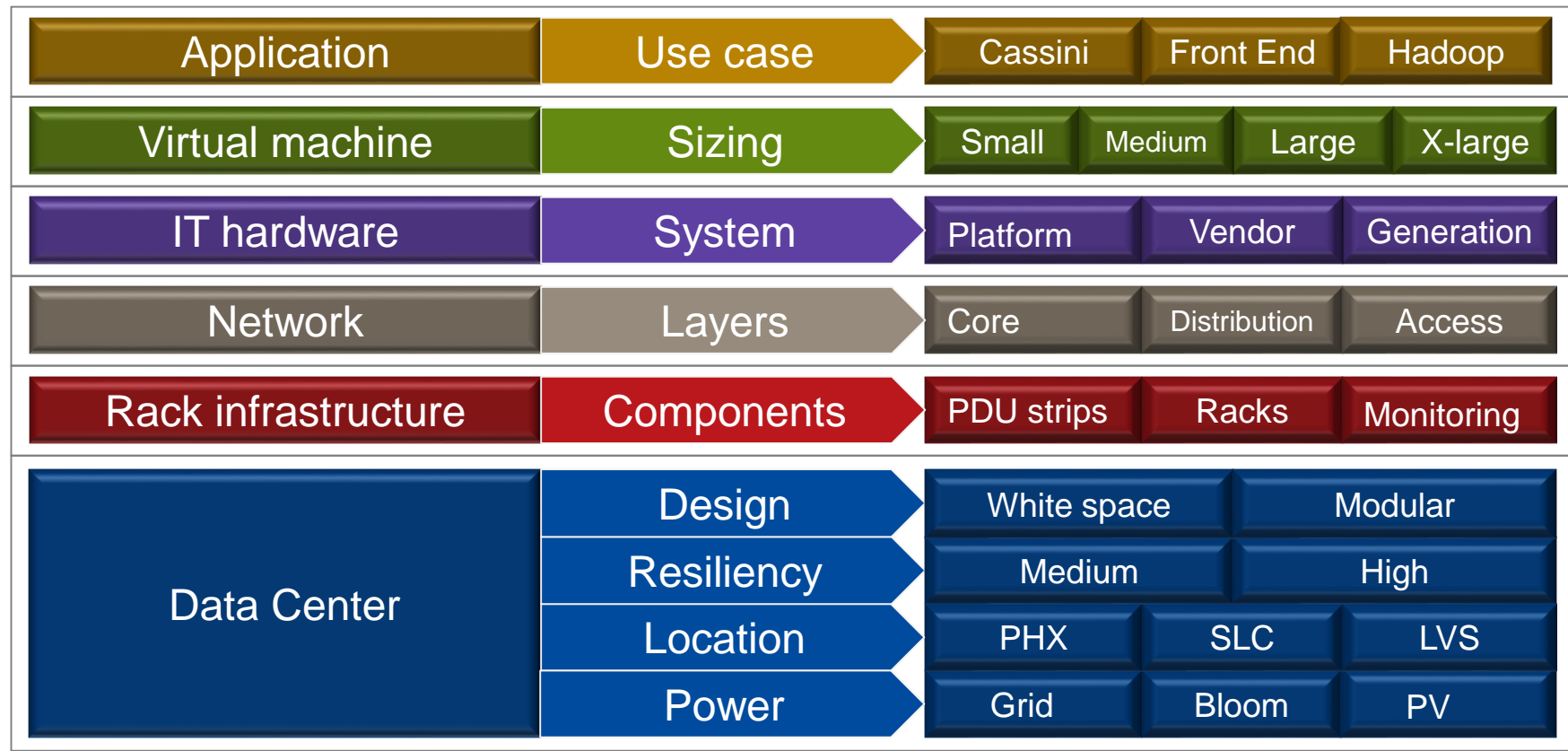
- eBay has 3 core data center sites in SLC, PHX and LAS.
- We operate 60MW of data center power and space.
- Data centers use approx. 60% of eBay's energy.
- Energy is 21% of the DC operational budget.

Holistic approach to design and operations

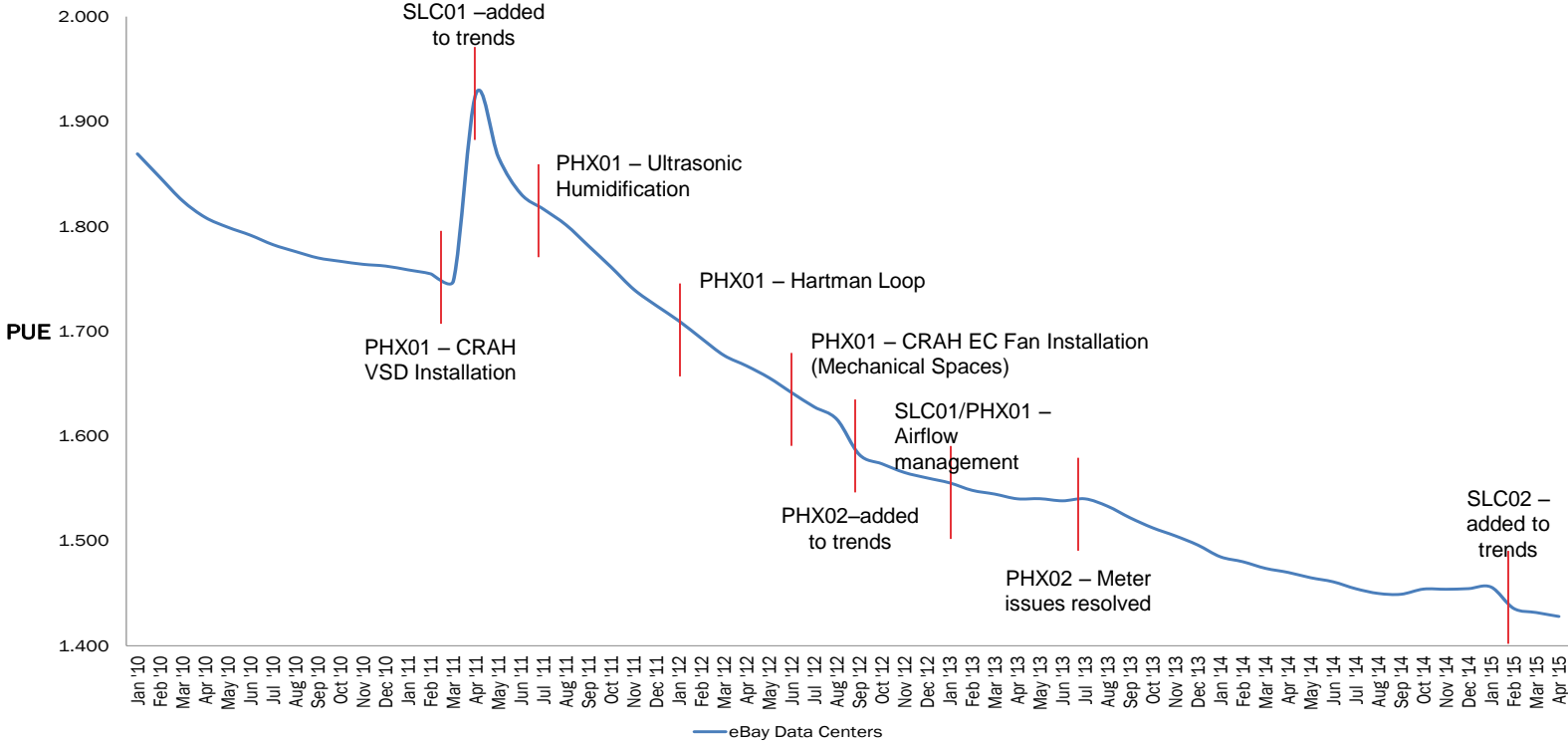
- Unify all teams, Design, Engineering, Partners, Operations and Finance
- Align metrics to a TCO, cost per MW.
- Build a complete system not a building.
- Drive for simplicity, use building blocks.
- Embrace continuous improvements.



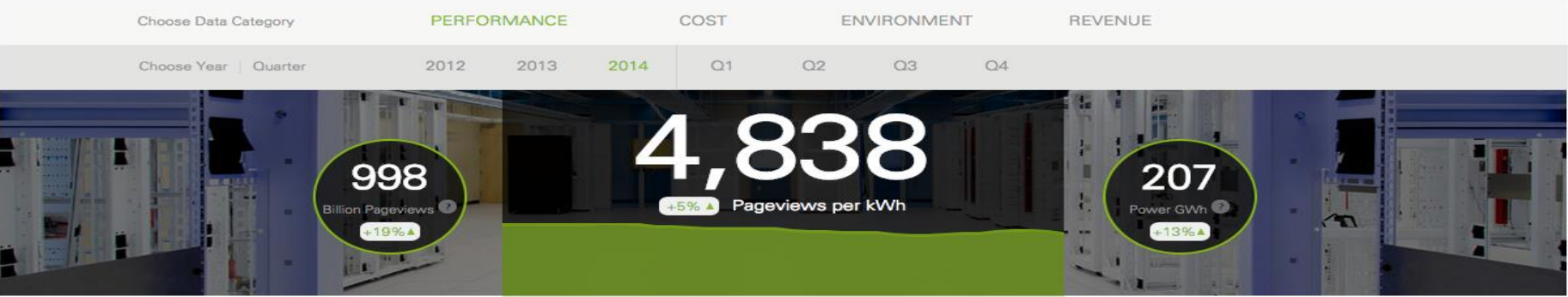
Technology stack modules



Power Usage Effectiveness (PUE) 2010-2015



Digital Service Efficiency Metric: 2014 Results



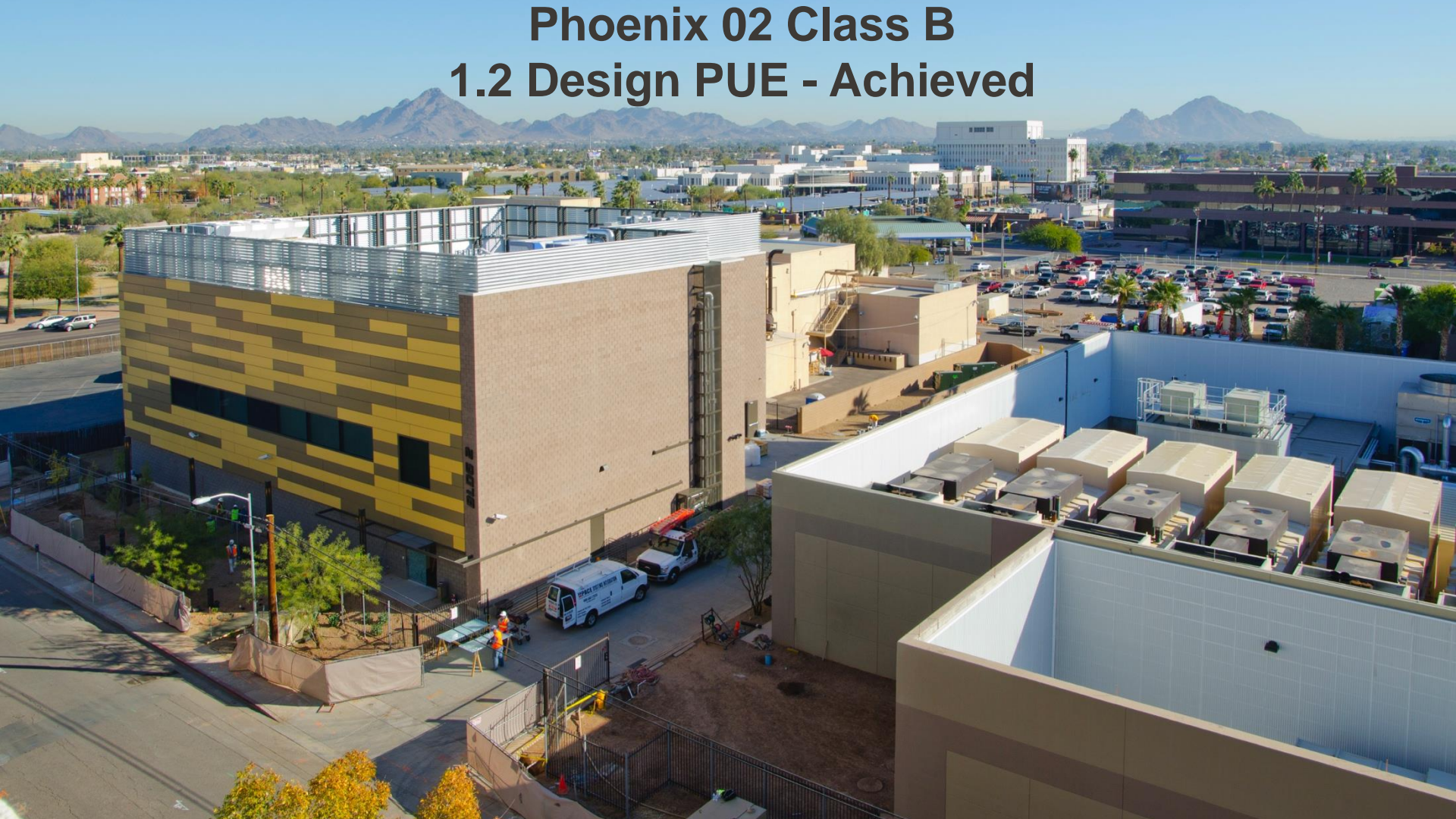
INFRASTRUCTURE		
ENERGY SUPPLY ?	DATA CENTER EFFECTIVENESS ?	INFRASTRUCTURE LOAD ?
CLEAN ENERGY 27.9 %	PUE 1.54 -2% ▼	ACTIVE BUYERS 155 Million +11% ▲
GRID 72.1 %	WUE 2.29 L / kWh -7% ▼	SERVERS 69,741 +22% ▲
	CUE 0.8 kg CO2e / kWh -23% ▼	POWER 23.6 MW +13% ▲

BUSINESS KPIs		
REVENUE ?	COST ?	CARBON ?
PER ACTIVE BUYER \$45.07 -4% ▼	PER ACTIVE BUYER -2 % -2% ▼	PER MILLION ACTIVE BUYERS 646 Tonnes -4% ▼
PER SERVER \$100,300 -13% ▼	PER SERVER -11 % -11% ▼	PER SERVER 1.44 Tonnes -13% ▼
PER MWH \$33,774 -8% ▼	PER MWH -4 % -4% ▼	PER MWH 0.48 Tonnes -8% ▼

Infrastructure Innovation



Phoenix 02 Class B 1.2 Design PUE - Achieved





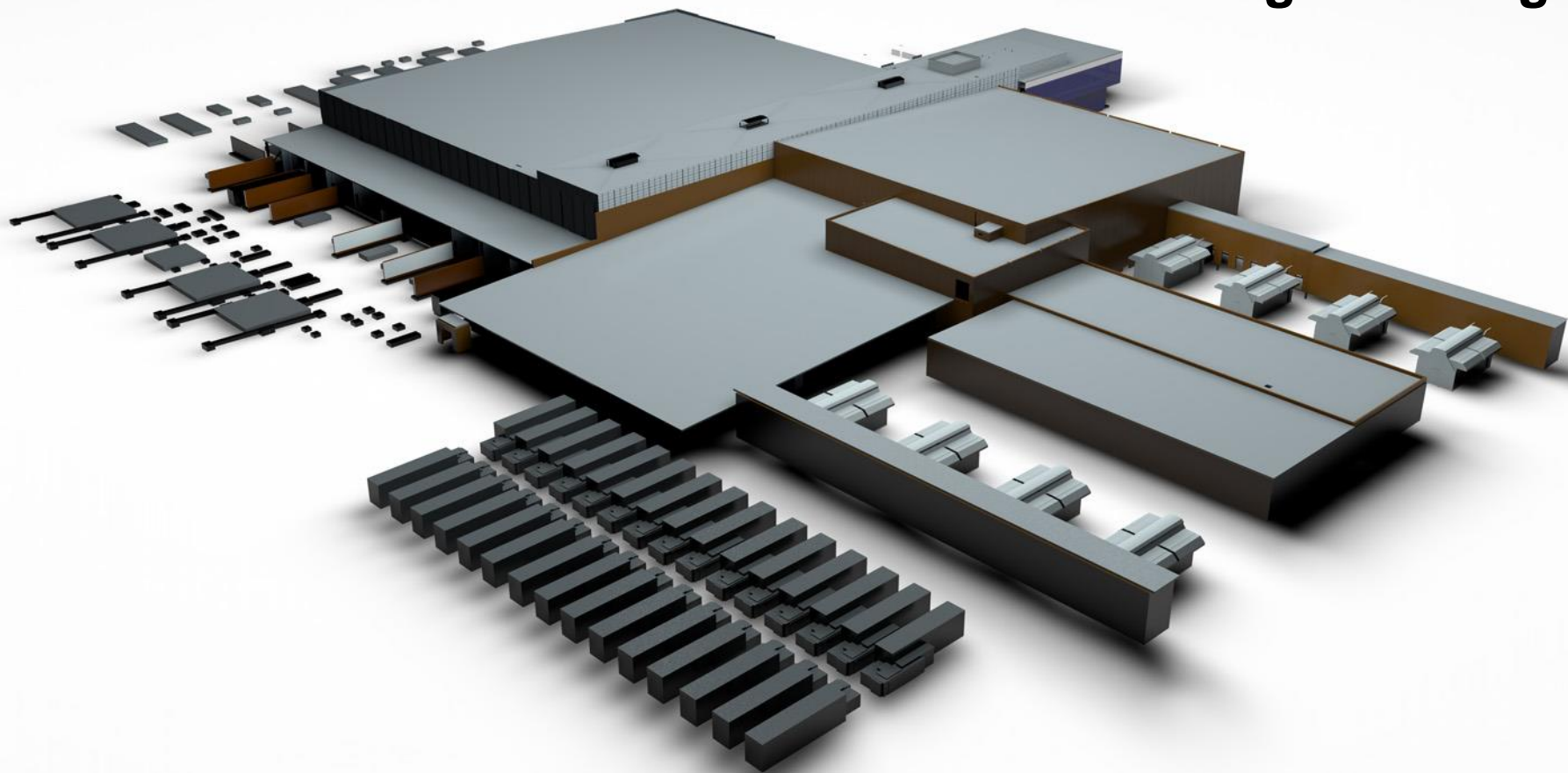
Salt Lake City 02 Class B

1.2 Design PUE

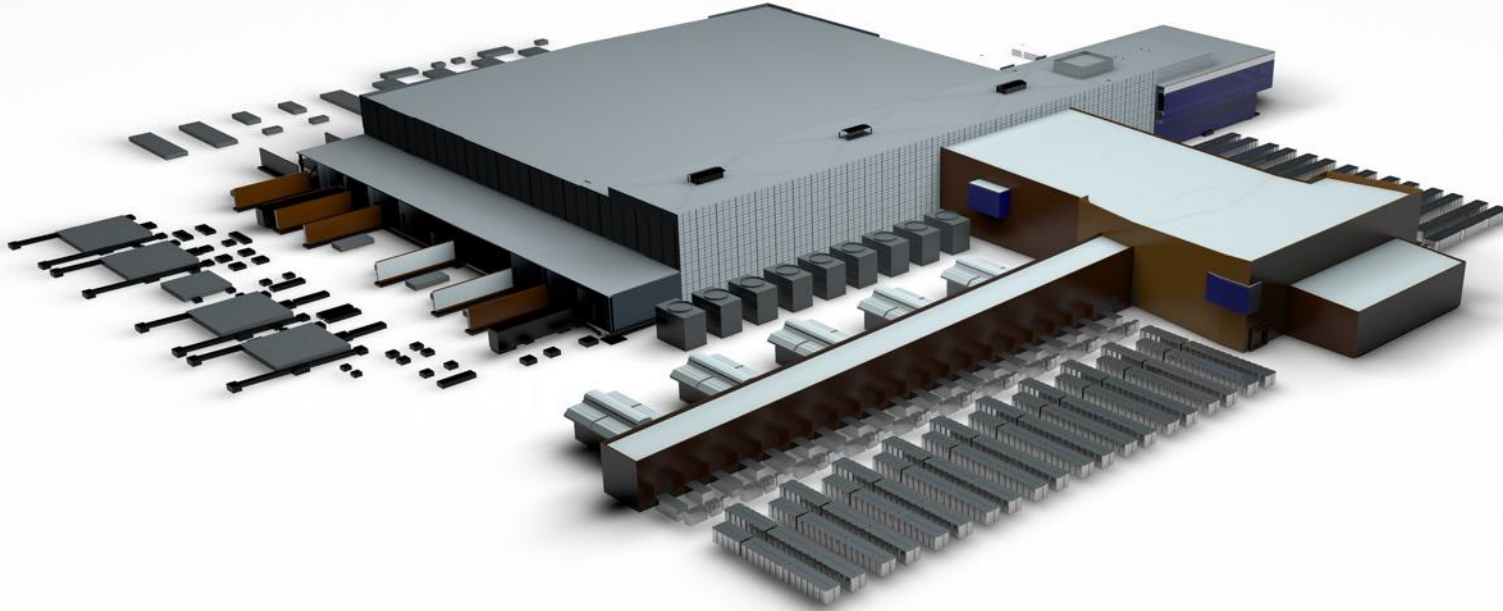
CONCURRENTLY MAINTAINABLE



Original Design



Fuel Cell Design



Decreased Building Size >50%
*Decreased CapEx per kW Costs >50%
Reduced Carbon Emissions per kWh 49%

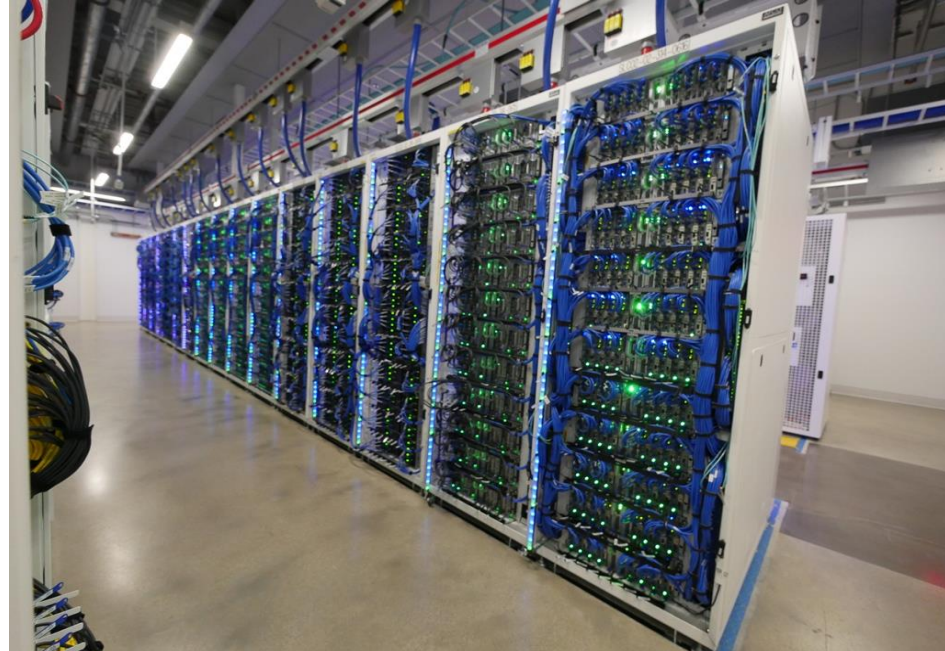
8MW of Bloom On-site Power Generation



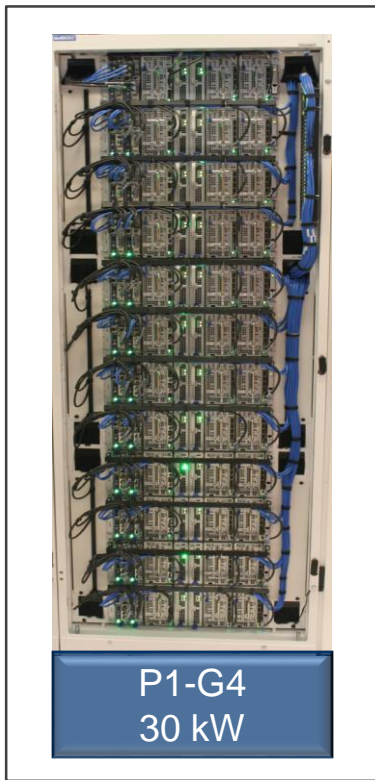
Modular Data Center's



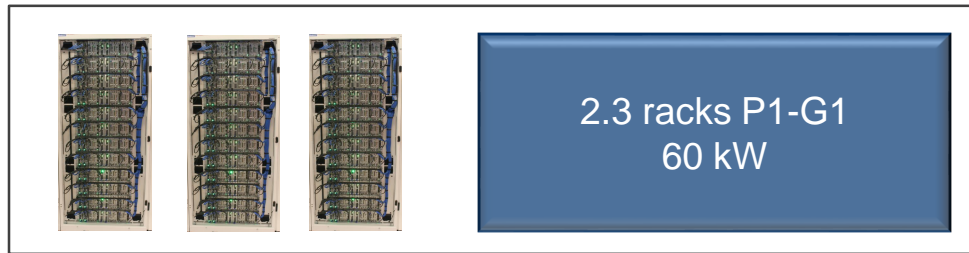
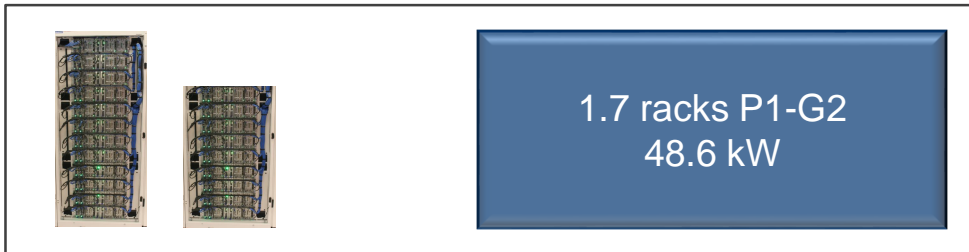
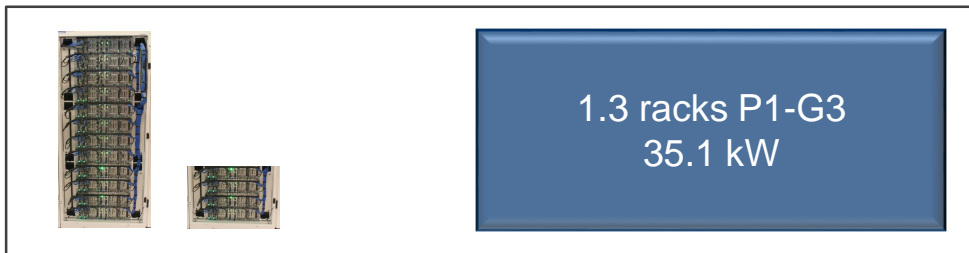
Optimized Racks - 96 node



Data Center Capacity Tech Refresh Optimization



CASSINI



ebay inctm

- Questions?