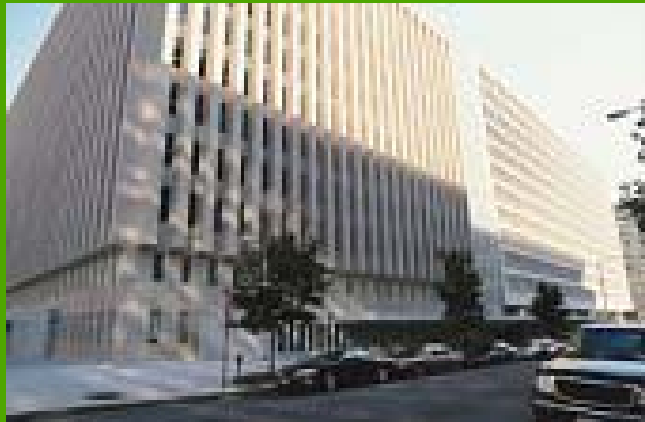


EnergySTEP1 Data Center Assessment Customer Report



XYZ Company Data Center 101

Assessment Prepared for:

ES1 Sample Report

David Smith

David.Smith@.xyz.com

401-555-1212 X 2168

Contents

- > Service Description
- > Data Center Scorecard
- > Floor Layout and Air Distribution
- > Computer Room Air Conditioners
- > Racks
- > UPS
- > Batteries
- > Priority Recommendations



EnergySTEP1 Data Center Assessment Service Description

- Identify the most significant issues wasting energy in the data center
- Provide recommendations for improvement with estimated energy savings
- Review operational characteristics of the data center for adherence to industry best practices
- Review maintenance records and identify threats to the availability of power and cooling components



EnergySTEP1 Data Center Assessment



Data Center Configuration

The data center physical configuration is summarized in the table below.

Description	Size/Type
Data Center Name	Data Center 101
Data Center Age (years)	15
Data Center Size (Sq Ft)	2220
Number of UPSs	2
Number of Racks	50
Number of CRACs	4
Number of Air Supply Tiles	49
Predominant Cooling Topology	Raised floor supply with flooded return
Predominant Cooling Configuration	Hot Aisle / Cold Aisle 75% Front to Back 25%

EnergySTEP1 Data Center Assessment Summary



➤ **Floor Layout and Air Distribution**



➤ **Computer Room Air Conditioners (CRAC)**



➤ **Racks**



➤ **Uninterruptible Power Supply (UPS)**



➤ **Batteries**

Scorecard



Subsystem efficiency and/or reliability is **significantly below average**. Further improvements are highly recommended.



Subsystem efficiency and/or reliability is **below average**. Further improvements are recommended to improve efficiency and/or reliability.



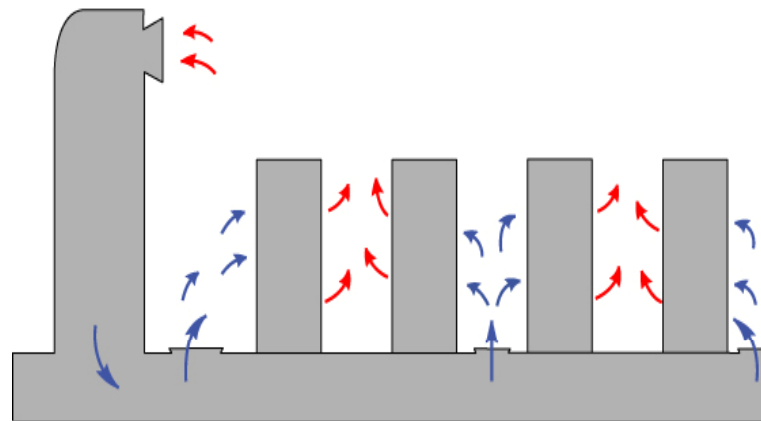
Subsystem efficiency and/or reliability is **average** for this data center. Further improvements may be possible, but the gains are likely to be minimal.



Insufficient data to rate system / subsystem.

EnergySTEP1 Data Center Assessment

Air Distribution Topology








Locally Ducted Supply / Flooded Return





- Legacy data center cooling system design
- Simple, low cost installation
- Low efficiency, high OPEX implementation due to the mixing of supply air and return air
- Typical rack density of 3kW per rack
- Maximum rack density limited to 6kW under optimum conditions
- Cooling of high density equipment in this type of environment is limited
- Recommended spreading high density loads throughout the data center

EnergySTEP1 Data Center Assessment

Floor Layout and Air Distribution






Rating	Finding	Recommendation	Energy Savings See Note1
	More than 25% of the air tiles are not located correctly in the data center.	Remove air tiles from hot aisles and where they are not directly cooling equipment.	1 - 4%
	Up to 50% of the rows not orientated perpendicular to the CRAC units.	Perform a more detailed assessment to determine corrective action and ROI.	2 - 4%
	Up to 25% of the rows not configured for hot aisle / cold aisle.	Perform a more detailed assessment to determine corrective action and ROI.	1 - 3%
	Several of the rows have gaps between the racks.	Install curtains, move racks together or install empty racks with blanking panels where possible.	1 - 3%
	There are a few missing ceiling tiles.	Replace ceiling tiles as needed. Seal as many penetrations as possible.	< 1%

Note1: Potential savings for a fully optimized data center. Total savings will be significantly less than sum of individual estimates.





-  Subsystem efficiency and/or reliability is **significantly below average**. Further improvements are highly recommended.
-  Subsystem efficiency and/or reliability is **below average**. Further improvements are recommended to improve efficiency and/or reliability.
-  Subsystem efficiency and/or reliability is **average** for this data center. Further improvements may be possible, but the gains are likely to be minimal.
-  Insufficient data to rate system / subsystem.

EnergySTEP1 Data Center Assessment

Computer Room Air Conditioner (CRAC)






Rating	Finding	Recommendation	Energy Savings See Note1
	Temperature demand fighting is occurring. One or more of the CRAC units is in heating mode.	Perform a more detailed assessment to determine root cause and corrective action.	Unknown without further analysis
	Set point temperature on one of the CRAC units was 60 deg F.	Increase and coordinate the temperature set points of the CRAC units. Make incremental changes and monitor rack inlet temperature compliance with ASHRAE TC9.9.	Unknown without further analysis
	One or more of the CRAC units was in humidification mode at the time of the assessment.	Verify temperature and humidification set points of the CRAC units to ensure demand fighting is not occurring.	Unknown without further analysis
	Some of the CRAC units may not be under an existing maintenance plan.	Implement a maintenance plan for each CRAC unit.	Not Applicable
	Some CRAC units have physical condition issues. Safety or availability may be compromised.	Repair or replace units as appropriate.	Not Applicable

Note1: Potential savings for a fully optimized data center. Total savings will be significantly less than sum of individual estimates.





-  Subsystem efficiency and/or reliability is **significantly below average**. Further improvements are highly recommended.
-  Subsystem efficiency and/or reliability is **below average**. Further improvements are recommended to improve efficiency and/or reliability.
-  Subsystem efficiency and/or reliability is **average** for this data center. Further improvements may be possible, but the gains are likely to be minimal.
-  Insufficient data to rate system / subsystem.

EnergySTEP1 Data Center Assessment

Rack Configuration

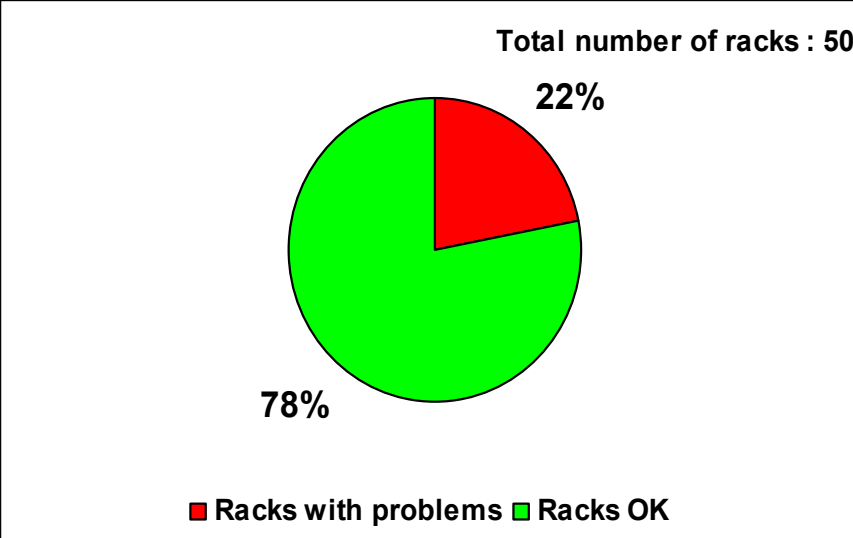
Rating	Finding	Recommendation	Energy Savings See Note1
	Less than 25% of the racks have missing blanking panels.	Install blanking panels during next maintenance window to improve airflow efficiency.	<1%
	Less than 25% of the racks are missing side panels.	Solid side panels improve air flow through the equipment and should be installed if possible.	1 - 2%
	The raised floor is a supply plenum. There is significant air leakage under less than 25% of the racks.	Install wire brushes or grommets to seal cable penetrations under the rack and improve airflow efficiency.	1 - 2%
	Up to 25% of the racks have inlet temperatures exceeding ASHRAE TC 9.9 limits (80.6 deg F or 27 deg C).	Perform a more detailed assessment to determine root cause and corrective action.	Unknown without further analysis
	Some data center racks have solid front or rear doors.	Remove solid front and rear doors on racks where the IT equipment is cooled from front to back.	1 - 2%

Note1: Potential savings for a fully optimized data center. Total savings will be significantly less than sum of individual estimates.

-  Subsystem efficiency and/or reliability is **significantly below average**. Further improvements are highly recommended.
-  Subsystem efficiency and/or reliability is **below average**. Further improvements are recommended to improve efficiency and/or reliability.
-  Subsystem efficiency and/or reliability is **average** for this data center. Further improvements may be possible, but the gains are likely to be minimal.
-  Insufficient data to rate system / subsystem.

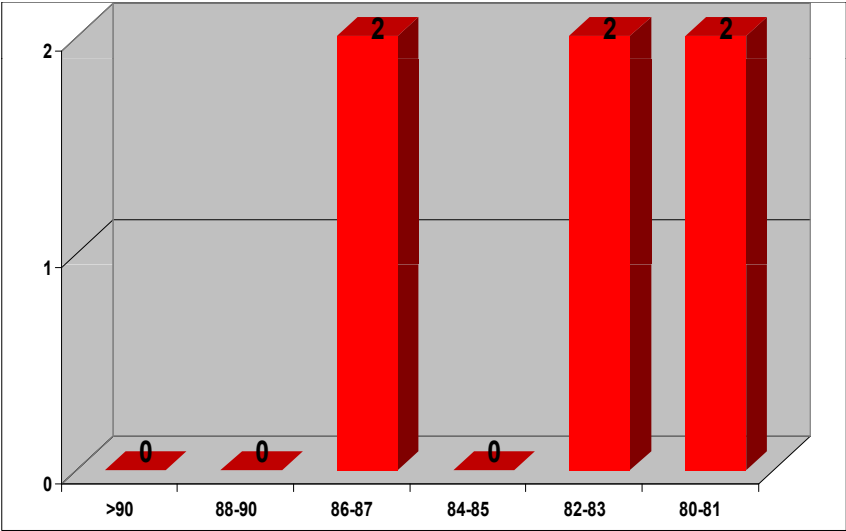
EnergySTEP1 Data Center Assessment

Overall Rack Status

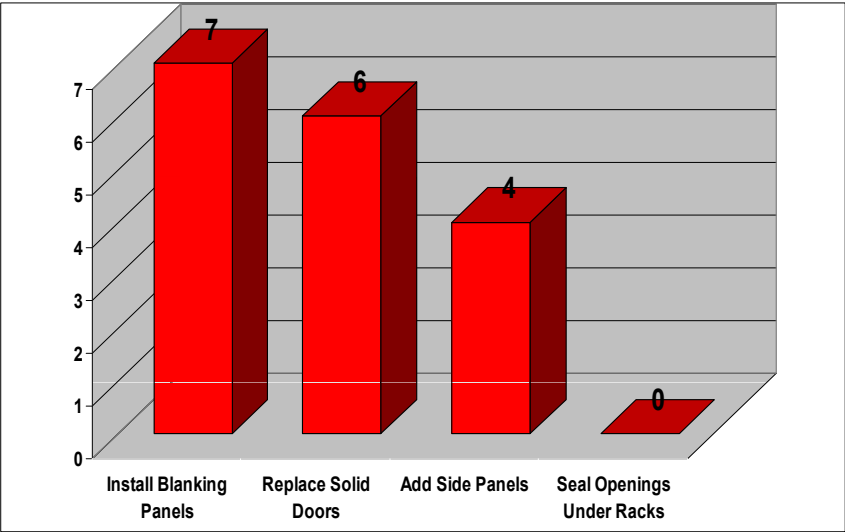


Rack Summary

Rack Inlet Temperature exceeding ASHRAE TC9.9








Rack Findings







EnergySTEP1 Data Center Assessment

UPS Z1 Configuration






Rating	Finding	Recommendation	Energy Savings See Note1
	UPS Z1 kVA load exceeds 80% of rated capacity. Transient power events may cause UPS to drop load.	Reduce the kVA load on the UPS to less than 80% of rated kVA load.	Not Applicable
	UPS Z1 efficiency is less than 70%.	Perform a more detailed assessment to determine if a new high efficiency UPS meets business and ROI requirements.	2 - 4%
	UPS Z1 output phase load imbalance is within 10%.	No corrective action required.	Not Applicable
	UPS Z1 has physical condition problems that may affect safety or reliability.	Perform maintenance as soon as possible to correct problem(s).	Not Applicable
	UPS Z1 may not be under an existing maintenance plan.	To ensure availability, implement a maintenance plan for the UPS if one does not exist.	Not Applicable

Note1: Potential savings for a fully optimized data center. Total savings will be significantly less than sum of individual estimates.





-  Subsystem efficiency and/or reliability is **significantly below average**. Further improvements are highly recommended.
-  Subsystem efficiency and/or reliability is **below average**. Further improvements are recommended to improve efficiency and/or reliability.
-  Subsystem efficiency and/or reliability is **average** for this data center. Further improvements may be possible, but the gains are likely to be minimal.
-  Insufficient data to rate system / subsystem.

EnergySTEP1 Data Center Assessment

UPS Z2 Configuration

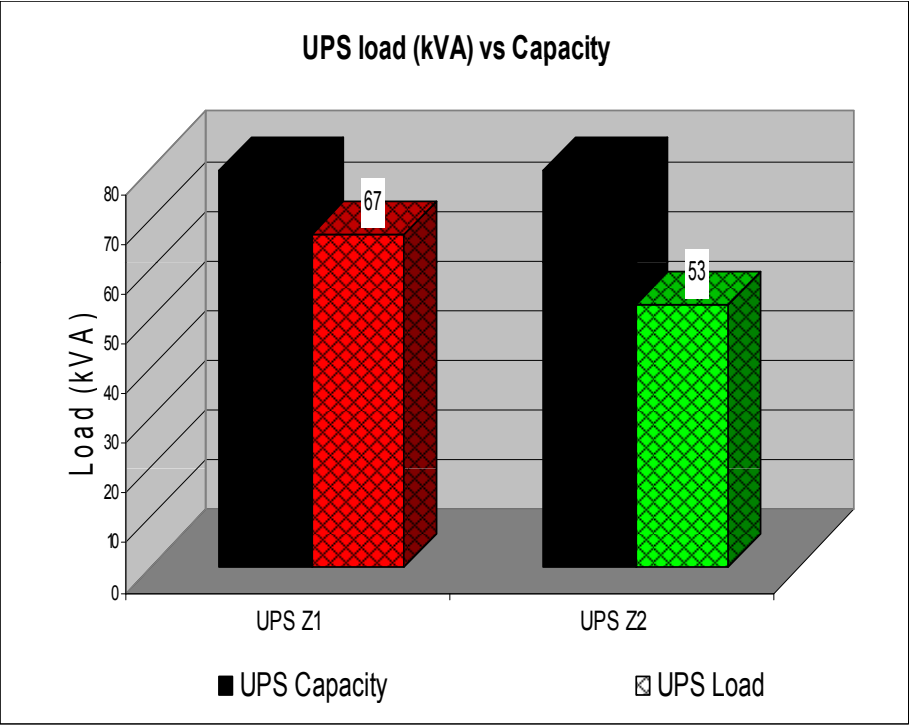
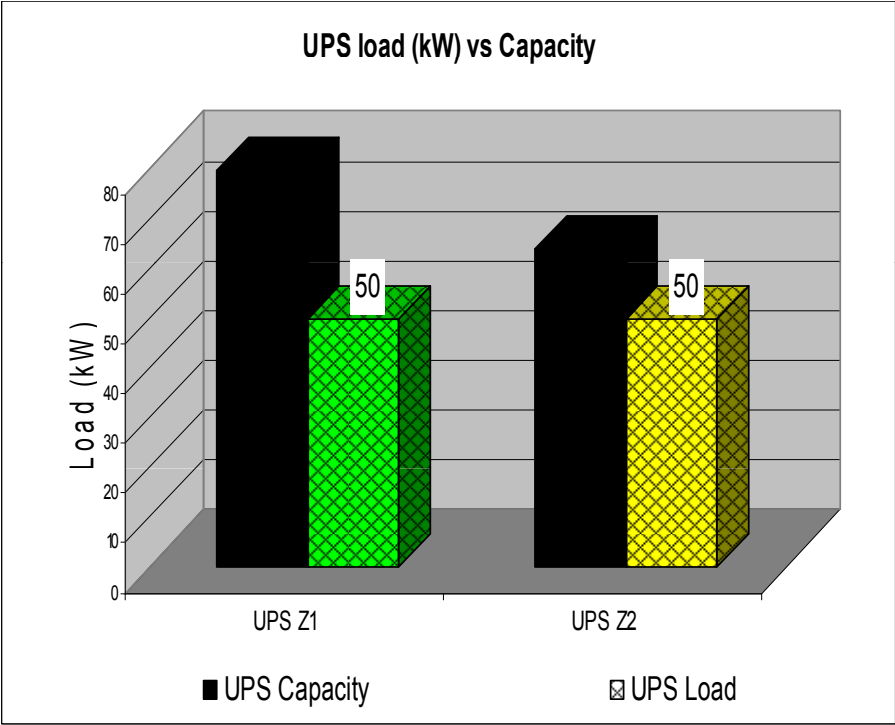
Rating	Finding	Recommendation	Energy Savings See Note1
	UPS Z2 efficiency is above 90% at its current operating point of 78% kW load.	None.	Not Applicable
	UPS Z2 output phase load imbalance is more than 20%. This may be causing re-circulating currents, harmonics and excessive heating of the UPS components.	Perform a circuit analysis to determine root cause and corrective action.	Not Applicable
	UPS Z2 is in excellent physical condition.	None.	Not Applicable
	UPS Z2 maintenance plan may not be up to date.	Review maintenance plan for UPS and ensure maintenance is up to date.	Not Applicable
	UPS Z2 is more than 10 years old.	Consideration should be give to upgrading to a new UPS due to reliability, parts availability and maintenance requirements .	Not Applicable

Note1: Potential savings for a fully optimized data center. Total savings will be significantly less than sum of individual estimates.

-  Subsystem efficiency and/or reliability is **significantly below average**. Further improvements are highly recommended.
-  Subsystem efficiency and/or reliability is **below average**. Further improvements are recommended to improve efficiency and/or reliability.
-  Subsystem efficiency and/or reliability is **average** for this data center. Further improvements may be possible, but the gains are likely to be minimal.
-  Insufficient data to rate system / subsystem.

EnergySTEP1 Data Center Assessment

UPS Utilization Summary



- UPS load exceeds 80% capacity. Increase the capacity of the UPS or reduce the load.
- UPS load is between 70% and 80% capacity. Load is within industry best practices but future load growth is limited.
- UPS load is less than 70% capacity.

EnergySTEP1 Data Center Assessment



UPS Z1 Battery Configuration

Rating	Finding	Recommendation	Energy Savings See Note1
	UPS Z1 batteries have corrosion on terminals and are showing signs of bloating.	Replace batteries immediately. Perform a more detailed assessment to determine root cause and corrective action for the corrosion and bloating.	Not Applicable
	UPS Z1 batteries have exceeded their design life.	Replace batteries as soon as possible.	Not Applicable
	UPS Z1 batteries are not under a maintenance plan.	Implement a maintenance plan for the batteries.	Not Applicable
	UPS Z1 battery ambient temperature is within industry guidelines.	None.	Not Applicable

Note1: Potential savings for a fully optimized data center. Total savings will be significantly less than sum of individual estimates.

- Subsystem efficiency and/or reliability is **significantly below average**. Further improvements are highly recommended.
- Subsystem efficiency and/or reliability is **below average**. Further improvements are recommended to improve efficiency and/or reliability.
- Subsystem efficiency and/or reliability is **average** for this data center. Further improvements may be possible, but the gains are likely to be minimal.
- Insufficient data to rate system / subsystem.

EnergySTEP1 Data Center Assessment



UPS Z2 Battery Configuration

Rating	Finding	Recommendation	Energy Savings See Note1
●	UPS Z2 batteries are not showing signs of leakage, corrosion or swelling.	None.	Not Applicable
●	UPS Z2 batteries have not exceeded their design life.	Continue to monitor battery age versus design life.	Not Applicable
●	UPS Z2 batteries are not under a maintenance plan.	Implement a maintenance plan for the batteries.	Not Applicable
●	UPS Z2 battery ambient temperature exceeds industry guidelines. Ambient temperature was 85 deg F. Accelerated aging of the batteries is occurring.	Reduce battery ambient temperature to below 80 deg F maximum, or increase maintenance schedule for the batteries and closely monitor physical condition and overall health.	Not Applicable

Note1: Potential savings for a fully optimized data center. Total savings will be significantly less than sum of individual estimates.

- Subsystem efficiency and/or reliability is **significantly below average**. Further improvements are highly recommended.
- Subsystem efficiency and/or reliability is **below average**. Further improvements are recommended to improve efficiency and/or reliability.
- Subsystem efficiency and/or reliability is **average** for this data center. Further improvements may be possible, but the gains are likely to be minimal.
- Insufficient data to rate system / subsystem.

EnergySTEP1 Data Center Assessment

Priority Recommendations

- More than 25% of the air tiles are not located correctly in the data center. Remove air tiles from hot aisles and where they are not directly cooling equipment. This will decrease load on cooling systems and improve efficiency.
- Temperature demand fighting is occurring. One or more of the CRAC units is in heating mode. Perform a more detailed assessment to determine root cause and corrective action. This is a significant contributor to energy waste in the data center.
- The set point temperature is 10 deg F lower (60 deg F) on CRAC1 than any of the other CRACs. This is most likely contributing to temperature demand fighting and excessive energy usage. Perform a more detailed assessment of the CRAC setpoints to determine if they can be coordinated and balance.
- Six of the racks have air inlet temperatures exceeding ASHRAE TC9.9 recommended temperature of 80.6 deg F. The elevated temperatures may contribute to increased failure frequency of the rack equipment. Perform a more detailed analysis to determine root cause and corrective actions.
- UPS Z1 kVA load exceeds 80% of rated capacity. Transient power events may cause UPS to drop load. Reduce the load on the UPS or increase the capacity.
- UPS Z1 batteries have corrosion on terminals and are showing signs of bloating. This is a critical issue that needs to be corrected immediately. Personnel safety and availability of the data center are at significant risk.