**Level 1**
**Data Center Assessment**



**Submitted by:**

**Electronic Environments Corporation**

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Electronic Environments
Infrastructure Solutions

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## SECTION 1 - EXECUTIVE SUMMARY

Electronic Environments Corporation (EEC) has evaluated the existing data center located at 555 North Duke Street. The goals of the study are:

A. Survey and document the existing conditions in the Data Center:

1. General conditions
2. Power Equipment condition
3. Cooling Equipment condition
4. Fire Suppression System Condition

B. Describe existing conditions and identify areas of potential concern.

C. Provide recommendations to improve deficiencies.

EEC conducted a site survey on January 31, 2013 to gather existing conditions. The findings are outlined in the following report.
In general, the data center, telecom spaces and associated infrastructure are congested and being utilized as much for storage of equipment, cardboard boxes, and old floor tiles as for server racks. System loads on the UPS Systems are non-redundant, with UPS-1 at 83% load and UPS-2 at 46% load.

Our recommendations include the following:

A. Best practices regarding floor tile arrangements and blanking tiles on the racks.

B. Removal of storage type materials from the data center floorspace, especially cardboard.

C. Installation of a remote emergency power off (EPO) button to adhere to NEC requirements for dedicated server space.

D. Installation of a ground loop and underfloor ground grid for better protection of the equipment.

E. Installation of a comprehensive control & monitoring system for the cooling system.

F. FM-200 Fire suppression system was last inspected December 2011 and is two months overdue.

G. UPS-1 has very minimal battery runtime and we would recommend additional batteries to increase it.

## SECTION 2 - EXISTING CONDITIONS/EVALUATION

### A. General Conditions

In general, the data center, telecom spaces and associated infrastructure are cluttered with storage of old equipment, cardboard boxes, and old floor tiles. The current raised floor space is a 44' X 70' staggered rectangle with over 2,800 square feet. The raised floor is 12" high. There is no apparent grounding ring or ground path for the server racks. Lighting is inconsistent throughout the space and there are several noticeable dark areas. Large portions of the room are used as storage space for old equipment and cardboard boxes. Three entrances to the room exist, one with an ADA compliant ramp. One entrance is blocked by stacked floor tiles.

### B. Mechanical Systems and Environmental Conditions

The data center and telecom rooms are conditioned by (4) Liebert computer grade cooling units as described in the table below and air is distributed via the raised floor plenum to specific locations in the space via perforated floor tiles. Server racks are aligned in a hot/cold aisle. Perforated floor tiles should be utilized in the cold aisles only, but in this case are also placed in hot aisles. Conduit and wire runs underfloor and creates some barriers to airflow. There are multiple hot spots throughout the space. Underfloor leak detection is present.

| Room Served | Unit Name | Make & Model | Year of Manufacture | Capacity |
|---|---|---|---|---|
| Data Center | LGHLIEBERT05 | Liebert Deluxe 3 | 2008 | 20-Ton Chilled Water |
| Data Center | LGHLIEBERT06 | Liebert Deluxe 3 | 2008 | 20-Ton Chilled Water |
| Data Center | LGHLIEBERT07 | Liebert Deluxe 3 | 2002 | 20-Ton Chilled Water |
| Data Center | LGHLIEBERT08 | Liebert Deluxe 3 | 2002 | 20-Ton Chilled Water |



### C. Fire Suppression Systems

The space is protected by a two-zone FE-25 Fike System. The system was last inspected in December 2011 and is overdue for a new inspection.

### D. Electrical Systems

The critical loads are supported by (2) 80kVA in-row APC Symmetra UPS Systems. Each UPS is 480V input and 208/120V, 3-phase, 4-wire output, though each system showed actual input voltages of 490V. Each UPS System consists of an APC Power Management Maintenance Bypass Rack, the Symmetra UPS, and one battery rack. Each battery rack has a string of (32) batteries. The load side branch circuit panels downstream of the UPS that

distribute to the racks are located intermittently throughout the data center. UPS-1 load is at 66kW (83%), and UPS-2 load is at 33.5kW (46%). No remote EPO in the data center was apparent.

The battery rack for UPS-1 consists of (32) total SYBTU1-PLP batteries, and the battery rack for UPS-2 consists of (32) total SYBTU1-PLP batteries. Runtime is two minutes for UPS-1 and 18 minutes for UPS-2.

Each UPS is supported by the building generator system.

## Data Center Electrical Systems

A summary of the major electrical equipment serving the data center is included in the table below.

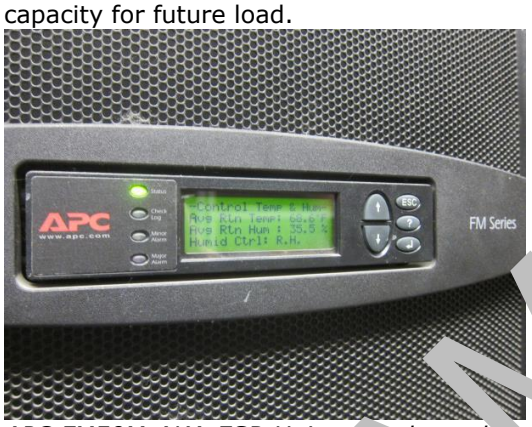
| Equipment | Location | Make & Model | Voltage | Capacity |
|---|---|---|---|---|
| UPS System - 1 | Data Center | APC Symemetra | 120V | 80kVA |
| UPS System - 2 | Data Center | APC Symemetra | 120V | 80kVA |
| Maintenance Bypass - 1 | Data Center | Power Management Rack | 480-120V | 80kVA |
| Maintenance Bypass - 2 | Data Center | Power Management Rack | 480-120V | 80kVA |
| Battery String -1 | Data Center | SYBTU1-PLP | 672VAh each | Quantity: 32 |
| Battery String - 2 | Data Center | SYBTU1-PLP | 672VAh each | Quantity: 32 |

## Project Observations

SSS Hospital operates a datacenter room supporting 45 kW of critical computer load (supplied by Uninterruptable Power Supply). There are two APC FM-50 (approximately 13 ton capacity) computer room air conditioners and an APC in-row cooling system installed and operating to cool the space, for a total cooling capacity of 108 kW. Return is through the space, with one unit suffering from a particularly poor return configuration – a low wall return in a cold aisle, forced by ceiling congestion.

This report will focus on identifying possible energy efficiency measures and estimating the savings available from these energy efficiency measures. Integral Group will work with XXX Hospital and National Grid to define which measures will be pursued before final incentive calculations are performed.

The units cooling the datacenter space currently do not provide full redundancy. They have the nameplate capacity to do so, but suffer from common airflow configuration limitations. Full or partial replacement of the units would address the lack of redundancy and provide additional capacity for future load.




*APC FM50M-AKA-ESR Unit control panel, note low return temperature*


*In-row cooler control panel*

*Low wall return to a FM50 unit, located in cold aisle space*



## Energy Efficiency Measures Assessment

### Baseline for Calculations

For the retrofit measures recommended here, the existing system is the baseline.

## Measures to be Analyzed

**Measure 1. Add In-Row coolers**

The energy savings from adding row coolers comes from two main areas:
Current in row cooler products incorporate variable air flow fans. Matching the airflow to the actual load in the room significantly reduces the power consumption of the unit.
In row coolers result in better air flow management – they collect the hot air exhausted by the racks from the hot aisle and cool it before it can short circuited to computer rack intakes.
An additional benefit of new units would be they could be provided as chilled water cooled units, which would allow the use of free cooling.
Three in row coolers would allow for the addition of 10kW, the retirement of the computer room air conditioner unit with a low wall return, and the delegation of the other computer room air conditioner to lag (backup) standby status. Savings are estimated to be in the range of 30,000 kWh per year.

**Measure 2a. Add evaporative cooling tower based free cooling**
**Measure 2b. Add drycooler based free cooling (glycol condenser loop, if a chilled water loop is impractical)**

Free cooling is a large energy savings opportunity for any datacenter since the cooling load is constant regardless of outdoor conditions. During cold weather a free cooling system will allow for the mechanical cooling compressors to be shut off. The primary question is what is the most economical method of implementing free cooling. The need to improve redundancy suggests that adding new units, which could have a free cooling option included, would be a suitable approach.
An open cooling tower that achieves a 7F approach to wetbulb (on the large side of typical sizing) would provide full free cooling to the datacenter for 4,000 hours per year. A drycooler approach could provide full free cooling to the datacenter for about 2,700 hours per year. The range of energy savings possible from the free cooling is 30,000 – 18,000 kWh per yr. An airside economizer could feasibly be installed, but it would require a significant modification of the humidification system; if dropping the RH setpoint in winter would be acceptable, airside economization would provide energy savings at the top of the range given above.

**Measure 3. Setpoint recommissioning**

Currently, all units are equipped with reheat capability. In a datacenter situation, reheat is never called for and could result in significant energy waste. It is unlikely the row cooler and unit with plenum return would have operating conditions resulting in reheat, but the low wall return unit could. It is recommended that reheat be permanently disabled.
Current ASHRAE TC9.9 recommendations targeting data center facilities recommend a significantly wider temperature and humidity control band. High humidification load was observed during the site visit. Reassessing the actual need for humidification in the space and widening the control band would reduce energy use.
The required temperature setpoint is another area that could offer opportunity. A higher temperature setpoint improves efficiency in a number of ways, but in this facility a higher setpoint is not recommended unless or until the air flow problems created by the low wall return are addressed.
Reassessing and reseting setpoint to closer to current recommended operation would save 10,000 – 20,000 kWh / yr.

## Cost for Investment Grade Analysis

The cost for incentive ready analysis for the above scope will be $4,200. Cost will be reduced if fewer measures are pursued.

## Included in Calculations

The measures will be calculated as stand-alone options. Full incentive analysis will provide calculations, cost estimating, and a report suitable for direct submission for incentive funding.

## Included in Report

A general description of measure.
Calculation result.
A description of baseline that is used to determine the savings (the current conditions).

## Deliverables –Detailed Analysis

Energy measures and payback calculations suitable for incentive submittal to National Grid
Cover report detailing key implementation methodologies
Phone conferences as required to complete scope
Post installation verification requirements

## Approval

Please indicate approval by signing below and returning a copy to us.

_____

For Client

_____

Name Date