

Data Centre.1 Refresh NHS Trust

Energy Savings Report



Aims: This study aims to measure the change in energy consumption between the current Data Centre (DC.1) and DC.1 post-refresh (DC.1.PR).

The critical IT load will remain the same throughout the measurement periods. A comparison can therefore be drawn between the power and cooling needed to support the IT equipment in DC.1 before and post-refresh. From there, avoided costs and CO₂ emissions can be calculated.

Purpose of the Data Centre Refresh: The refresh was required to replace the aging power and cooling infrastructure to:

1. Increase resilience
2. Increase capacity
3. Deliver energy savings

Measurement Boundary: Energy savings will be determined within a measurement boundary that encompasses only the power and cooling systems required to support the IT equipment. The IT load will not change. This M&V study shall not include any measurements or calculations regarding the lighting or fire systems in each room.

Interactive Effects: All interactive effects should be accounted for automatically through the measurement of the power and cooling.

Measurement Collection: Measurements of the electrical power required by the UPS and cooling will be taken from inbuilt metering within each system. There is very little change in power consumption as can be seen in Fig.1. It is therefore possible to take spot readings and assume the systems maintain a steady load.

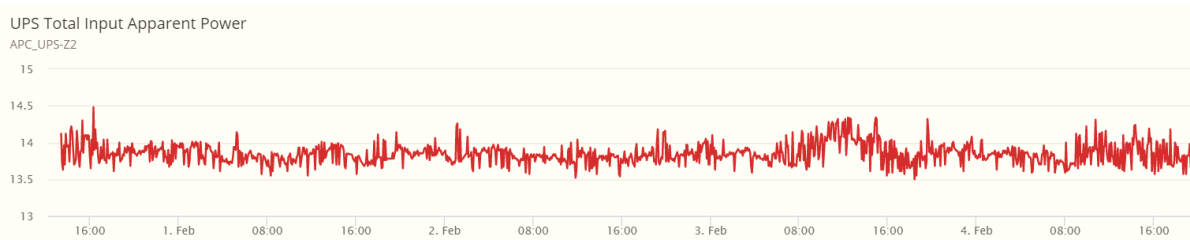


Figure 1, UPS Load. Graph showing the load remaining within 1kW over a 4-day period averaging out at a load of 13.8kW (unity power factor)

The chiller load is not dramatically effected as there is no significant mechanism to allow external ambient heat to enter DC.1 on a warmer day, it is not therefore necessary to consider external ambient temperature in reference to DC.1.

Pre-Retro Fit Measurements Include:

1. UPS – inbuilt metering
2. In-Row Cooling – in built fan speed sensor, obtain the power rating of fans
3. External Chillers – in built metering

Post-Retro Fit Measurements Include:

1. UPS – inbuilt metering
2. In-Row Cooling – inbuilt metering
3. External Chilled water units – wall mounted metering
4. External free cooling unit – wall mounted metering

Two types of cooling are available in DC.1PR. Free cooling and chilled water. It is necessary to assume run times from each of these cooling methods. The power consumption for both free-cooling and chilled water can be measured from wall mounted metering.

Base Line Period: As spot measurements are being taken, the base line period in this study will comprise of a 1 second period during the normal operation of DC.1.

Reporting Period: The reporting period will comprise of a 1 second spot measurements of power and cooling post-refresh.

Measurements Calculation and Results DC.1:

UPS Load: Measurements taken from in-built metering

UPS 1:	9.3 kW
UPS 2:	13.8 kW
Total:	23.1 kW

External Chiller Load: Measurements taken from wall mounted metering

External Chiller Load:	34.1 kW
Total:	34.1 kW

In-Row Cooling Unit Load: Calculated on unit load and quoted wattage

Max Fan kW:	0.115 kW
Measured Fan Load:	50.6%
No. of Fans:	48
Total In-Row Cooling Load:	2.8 kW

Overall Facility Summary

<i>Total Load of DC.1 kW:</i>	60 kW
<i>Total IT Load DC.1 kW:</i>	23.1 kW
<i>Power Usage Efficiency:</i>	PUE 2.96
<i>kWh per Year:</i>	525,600 kWh
<i>Est Running costs @ £0.17 kWh:</i>	£89,352.00
<i>Estimated CO₂ (average UK Grid):</i>	184,780 kg/CO ₂

Measurements Calculation and Results DC.1 PR:

UPS Load: Measurements taken from in-built metering

UPS 1:	15.0 kW
UPS 2:	8.0 kW
Total:	23.0 kW

External Chillers and free Cooler Load: Measurements taken from wall mounted metering

External Chiller Load:	11.0 kW
External Free Cooler:	4.0kW
Total average:	7.5 kW

Assuming equal operation of free cooler and chillers

In Row Cooling Load: Measurements taken from In built metering

In Row cooling Load:	0.6 kW
Total:	0.6 kW

Overall Post-Retrofit Facility Summary

Total Load of DC.1 kW:	31.1kW
Total IT Load DC.1 kW:	23.1 kW
Power Usage Efficiency:	PUE 1.35
kWh per Year:	272,436 kWh
Est Running costs @ £0.17 kWh:	£46,314.12
Estimated CO ₂ (average UK Grid):	95,778 kg/CO ₂

Estimated Saving

Avoided Running costs per year:	£43,037.00
Avoided CO ₂ /year:	89,002 kg/CO ₂
