



Data Center Benchmarking

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Agenda

Wenatchee, WA CC-1 Data Center Design

Data Center Operating Conditions

Energy & Environmental Baseline & Results

Energy Efficiency Improvement

Reliability Benefit



Yahoo! CC-1 Project Description

- Sited in Eastern Washington to take advantage of clean hydro power & cool dry climate
- 20,000 square foot raised floor on dedicated floor of multi-tenant office building
- Open-frame IT Racks arranged in a hot/cold aisle configuration
- Lack of blanking plate barriers & missing racks as well as the relatively low ceiling in the data center creates a substantial amount of mixing of hot and cold aisle air



Yahoo! CC-1 Data Center Design

- 3,000kW of UPS Capacity supported by 2N utility feeds
- N+1 paralleled generator plant
- N+1 air-cooled chilled water plant
- Central Cooling Plant designed with both air and water-side economizers
- (4 x 344 ton chillers)
 - VFDs on Primary/Secondary pumps
 - 18,000 gallons CHW storage
 - (3 x 590 MBH) dry coolers



Yahoo! CC-1 Data Center Design

- Data center electrical equipment room cooling provided by four CRAH units (4 x 14,000 CFM)
- Small server room cooling provided by four additional CRAH units (4 x 11,000 CFM)
- Monitoring of IT load and total power usage for the building provided by power metering on main utility feed and all UPS and PDU systems
- Monitoring of cooling plant tonnage for chillers and dry coolers



Yahoo! CC-1 Data Center Design

- AHUs sized to run at reduced capacity during normal operation and at capacity during failure mode
- AHUs are distributed on building perimeter & capable of 100% outside air economization
- Building relief air fans (28 x 19,000 CFM) with VFDs
- Relief Fans sized to run at reduced capacity during normal operation and at capacity during failure mode



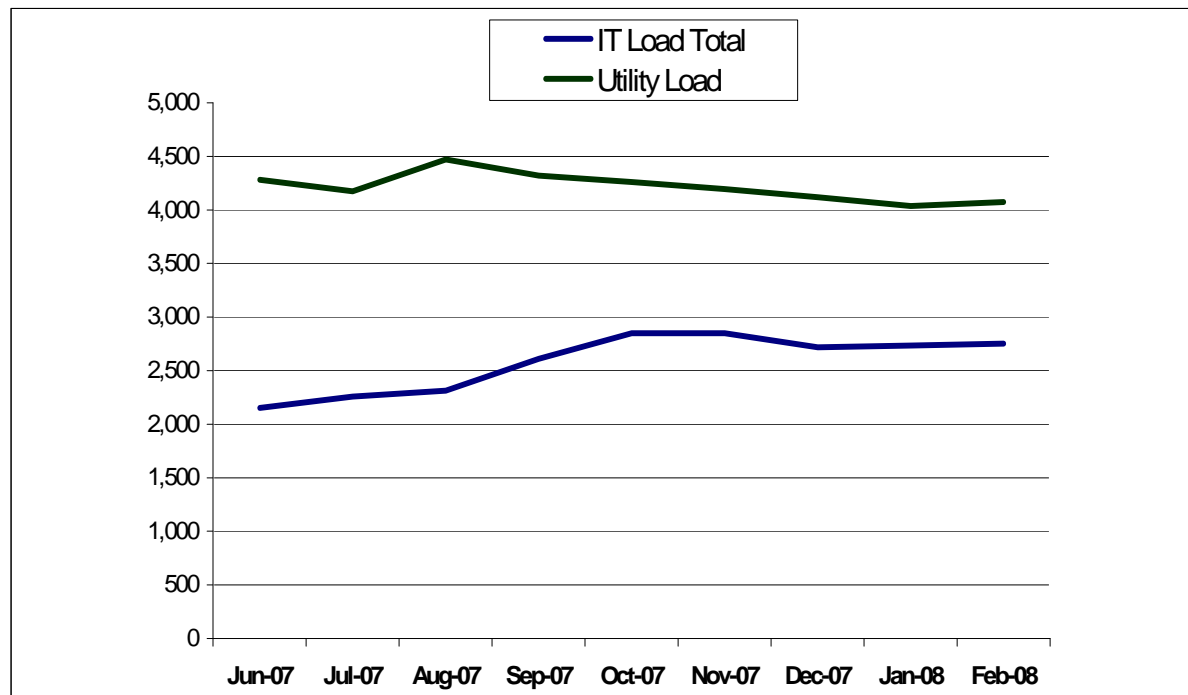
Yahoo! CC-1 Data Center Operating Conditions

- Designed to automatically stage chillers and pumps based upon SCW flow
- Dry coolers operate when outside air temperature falls 10 degF below CHWR temp
- Dry coolers/pumps staged to maintain the desired chilled water supply temperature setpoint
- CHWS of 42 degF, CHWR of 55 degF with an ave.12 degF delta T
- AHU discharge SAT reset to maintain 68 degF cold aisle zone temperature
- AHUs and relief fans air flow reset to maintain under-floor and room pressure at 0.05 " w.g.

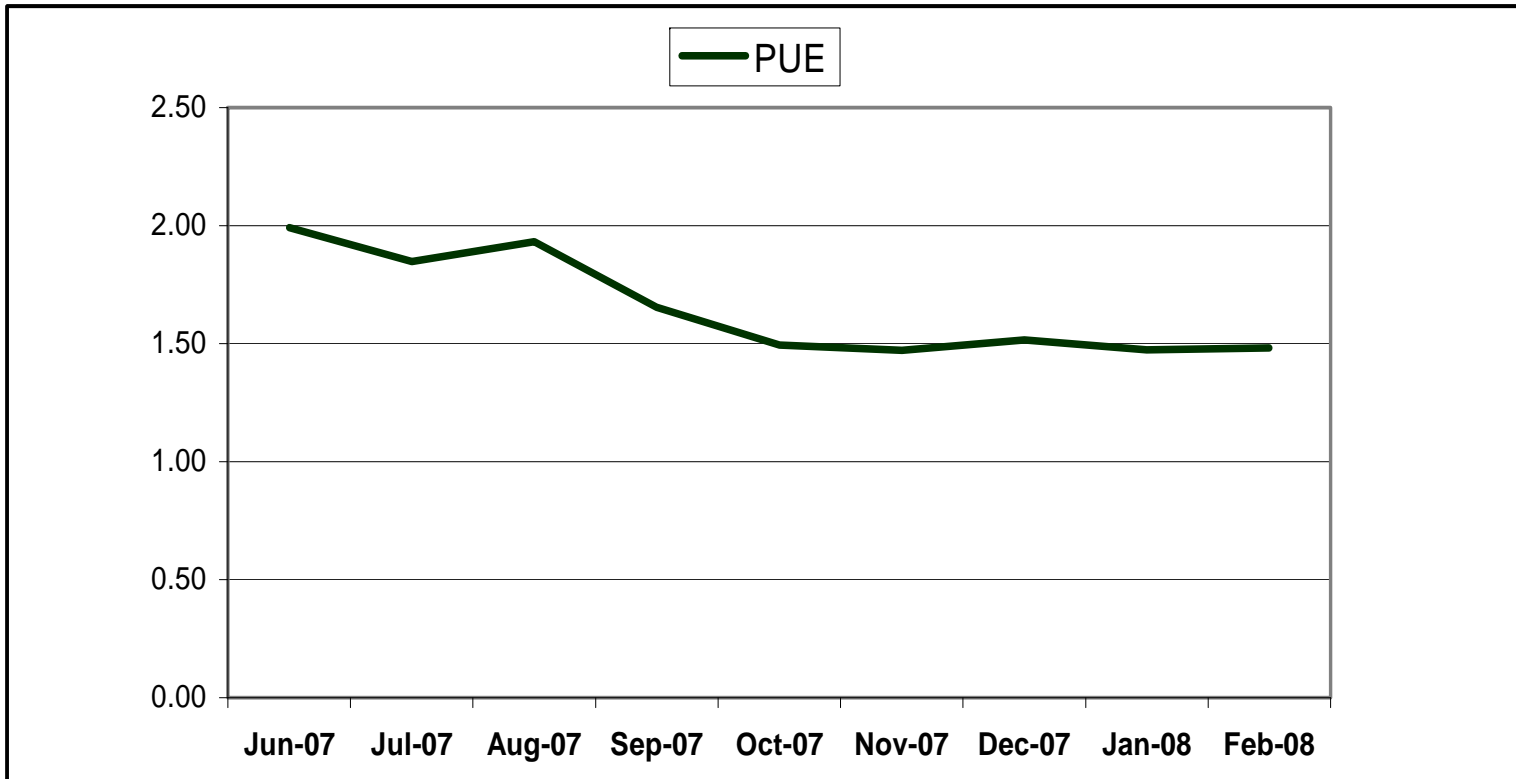


Yahoo! CC-1 Free-Cooling Benchmarking

- Benchmarked energy efficiency savings from air and water-side free-cooling
- Compared the difference in cooling PUE between the winter and summer months, when the data center runs on 100% economization with the chillers turned off



Yahoo! CC-1 Energy Efficiency



- Free-cooling provides an average savings of 560 kW per month for ~ 5.5 months of the year or 2,250,000 kWh/year

