Critical Facilities Round Table
“THINK TANK”

“Back Up Cooling Solutions after Power Loss”
PG&E Pacific Energy Center
February 25, 2008

Meeting Minutes
45 Attendees – Data Center IT and Facilities Managers, Engineering and Management Consultants, and HVAC and Electrical Equipment Suppliers

Introductions and CFRT Business:

LABS 21 Conference with Data Center 21 Track coming to Santa Clara in 9/08 with speaking, sponsorship and attendance opportunities available
Uptime discount $800 if signed up through Grove Associates blog
SVLG presentations scheduled for first week in June
Chill off will be included

Think Tank Challenge and Proposals:

Goal today is to share technical solutions – out of the box operation
Challenge – asset not lasting
New solutions around air cooling
Liquid cooling solutions – make it easy to convert – water or coolant
Ride through… how much time available?
Use outside air?
Ice storage
Chilled water storage
Seconds instead of minutes – using UPS for ride through
5-30 minutes ride through until generators start
Open architecture – plot of gradient vs. heat density
Semi-enclosed
Enclosed- ride through less than 1 minute 400 watts/ft²
Some putting CRACs on UPS power, also chilled water pumps
Experimental data to match calculated gradients?
Chiller restart is problem – up to 15 minutes
Server may shut off above some temperature – variable speed or two speed fans will ramp up, processor may slow down
Sun has fans and chilled water pumps on UPS.
Uptime study servers at top of racks fail more frequently
Rate of change effects may not show up immediately
Rate of change is more critical than high temperatures.
Problems might be in storage devices
Sleepy drives…. Spin down when not in use. Copan spins down drives
Blade mfgs looking at flash drive for storage.
Thermal for storage can be different than processors.
Risk aspects: ambient temp. raise set points to just below where server fans ramp up but then there is less time
Telecom turns off thermal protection in servers (Magnus)
Rack level monitoring for real load and back-up power sizing
Monitor temp on server – exists – what do you pick up out of thousands of points.
Sun establishing modular
Virtualization can minimize loss
Less than mission critical equipment – could be dropped (demand response)
Shift load from one center to another.
Ratchet down chiller etc. using vfds to match only what UPS needed
Power sags cause same chiller restart issues. Multiple sags in an hour – chiller restarts again. Mechanical plant would “bounce”. Solution - two main switchboards configure 50-50 with control logic so half goes on generator and creates less demand when it restarts.
Co-location center creates challenge
Need to bridge IT and facilities. Sun created group within real estate with IT and facilities experience. Weren’t speaking the same language. Now getting loads right.
How to get to engineers? Show new solutions….drag them along.
Best practices need to be shared.
Bit torrent? (Deborah Grove)
Haven’t come very far in coordinating IT and facilities
Enclose hot aisles – would leave more volume of cold air for ride through
Fail with economizers open – provide air for ride through
Sun looking at system solution
Rocky Mountain Energy Charrette – different cap ex and op ex budgets
How do we keep energy going when power goes out?
Chevron developed bill back procedure: $8M down to $3M
Utility power will have disturbances – get record of
Variable speed devices give soft start – vfds also solve some power quality issues
Voltage sags are most common. Semiconductor equipment has ride through for sags. Can chiller be made to do this?
Better controls are needed – need to put pressure on suppliers
200 temp sensors around 10,000 sf space (Broadcom)
Better monitoring is needed – keep track of changing loads/heat loads. Need to be real time? Not necessarily.
How to keep air going to computer?
Typical – use utility and generator
Pumps and fans on UPS - problem everything goes through UPS – power loss; additional cost
Inverter – for connecting to pumps fans etc. (why not feed DC directly to vfd’s?)

Vendor comments on CFRT Proposals:
Static UPS Vendors - Transient impact on batteries? Mitigate impact of transient for aging of batteries (is this frequent enough to worry about?) Like a generator damage curve – where does damage occur over what point in time? Also need to consider data loss. Latency issues, etc. Not just ride through – Have to have backup for high intensity Inverter option – lots of things need to be considered. Would vendors factories like to develop this technology. 200kW for pumps and fans. PUE 1.3 for just pumps/fans for 750kW UPS topologies approach the efficiency of the inverter. Efficiency is not the issue since loads would not normally go through this Will get variable speed everything in the future

Rotary UPS Vendors: –
1. Efficiency higher. 8-10 pts better. Could put all on including chillers. motor generator – generator could supply facility part, motor supply others. Option available without generator. Fed from flywheel or battery.
2 - Power factor improver and harmonics isolator. Std. gen set as backup and optional product would provide backup for excess of 30 seconds so no interruption at all. Frequency stabilization? Could have rotary e.g. Pillar (5% loss) but inverter is only 3%
Any power concerns for mechanical systems off same system as IT? Not really.
3 – flywheel. Scalable on same frame.
Plan to have committees meet and once technical issue is discussed and resolved CFRT will issue a paper.
Reduce server power supplies in emergency (demand response?) turn off A or B side
Look at solutions involving software. How fast can it react?

Back up cooling after power loss - AREAS FOR FURTHER STUDY

Electrical
  Static vs rotary
  Cooling fans and pumps on inverter
  Efficient UPS support fans & pumps
  VSD/controls start up of equipment

IT Systems
  Reduce heat load at power supplies (A or B turn-off)
  Turn down processors
  Change storage device heat load

Cooling
  Thermal energy storage
  Air flow control to improve capacity
  Outside air to support recirculation

Others
  On site generation
NEXT CFRT MEETING

March 12 CFRT Energy Committee Meeting at Altera IN San Jose
In-row cooling
Inverter power supplies