

**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/ft<sup>2</sup>  
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