# Today's Webcast starts at 1:00 p.m. Eastern.

## Today's Moderator

**Wendy Dietzler**

***Vice President of Education***

***Trade Press Media Group***

## Today's Presenter

### David Boston

Director of Facility Operations Solutions,
TiePoint-bkm Engineering

David Boston has more than 30 years' experience in critical facilities. He has worked at GTE Data Services as well as with the Uptime Institute. Since 2009, he has provided assessments, staff plans, and the development of comprehensive procedures and training programs for critical facility clients throughout North America and Europe. David serves as Director of Facility Operations Solutions for TiePoint-bkm Engineering, a firm specializing in the design of mission critical data centers.

# Learning Objectives:

- Identify common contributors to lapses in mission critical operations
- Analyze keys to effectively improving and extending continuous operation records
- Review examples of successful practices for highly successful operations
- Understand the importance of continuity as it applies to staffing, commissioning, training, the IT-Facilities relationship, preventive maintenance and assessments.

# Presentation Handouts

All participants will receive an e-mail by the end of the day with a link to download a PDF copy of today's presentation slides.

# CEU Information

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# Critical Facilities Summit 2017

- October 23-25
- Minneapolis Convention Center
- 500+ attendees, 100+ exhibitors
- 40 + sessions
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# Rectifying Chronic Lapses in Critical Facility Operations

PRESENTED BY
**David Boston**
Director, Facility Operations Solutions
TiePoint-bkm Engineering, LLC

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# Speaker's Background

- Managed 100k sq. ft. critical data center facility for GTE Data Services (now Verizon) 1985 - 1995
- Site Uptime Network Program Director 1996 - 2009
- ComputerSite Eng. assessment team leader 1996 - 2009
- David Boston Consulting 2009 - 2013
- TiePoint·bkm Engineering since October, 2013
  - Critical Facilities Operations, including new facility start-up strategy and implementation assistance, procedures and training programs, infrastructure and operations assessments

# Where Do Facilities Outages Occur?

# Where Do Facilities Outages Occur?

- Are more caused by **equipment failures** or **people** working with systems?
- Which part of the facility's infrastructure is ***most prone to component issues***?
  - UPS system
  - Cooling system
  - Power distribution within the computer room(s)

# Outage Origins (continued)

- Which part of the facility's infrastructure is the **source of most computer processing outages**?
  - UPS system
  - Cooling system
  - Power distribution within the computer room(s)
  - Generators

# Common Omission Categories

- Staffing
- Commissioning
- Training
- Practice time
- Orientation
- IT-Facilities Relationship
- Data center rules
- Procedures
- PM program
- Spare parts program
- Team continuity
- Assessments

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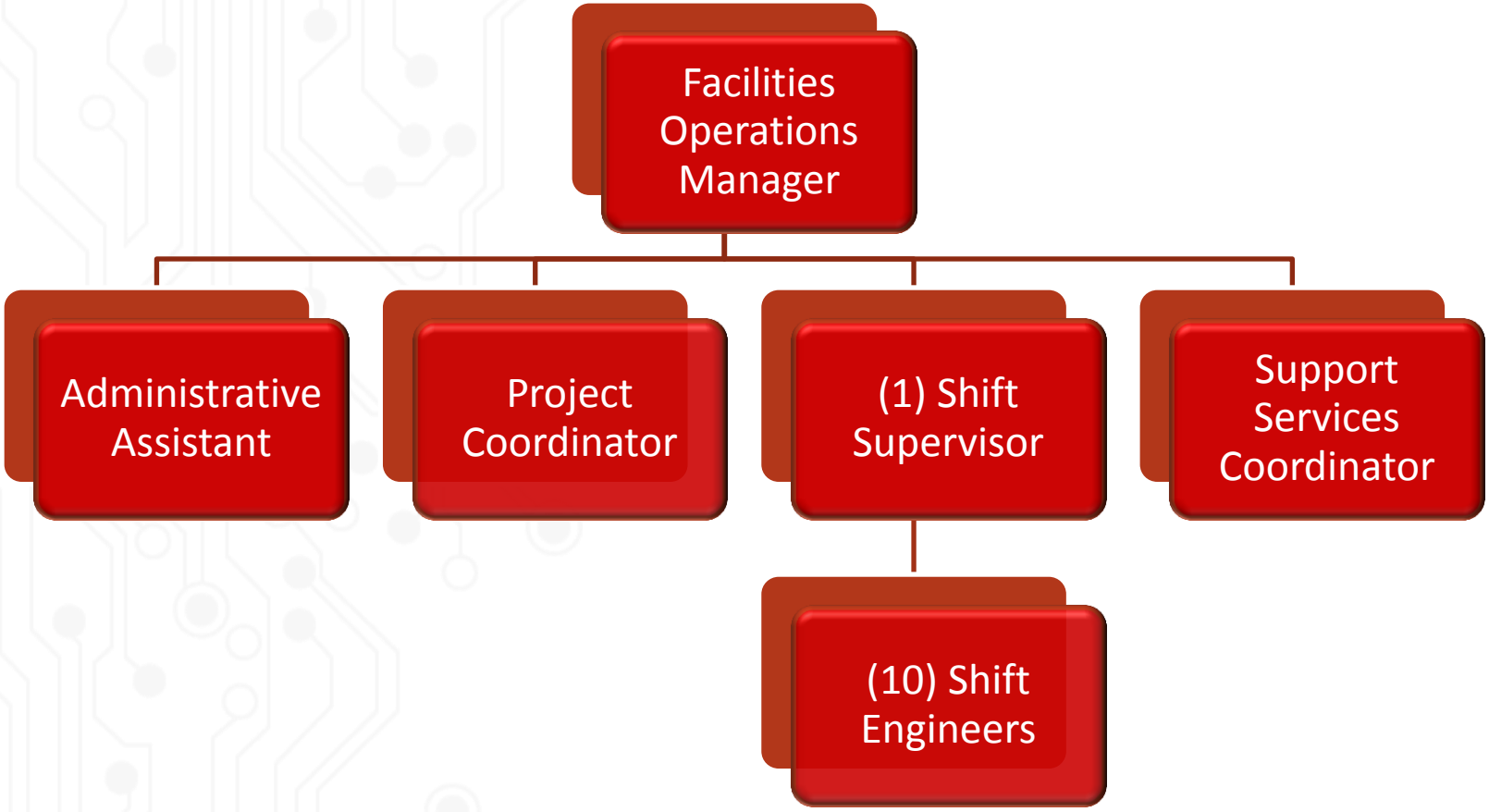
# Critical Facilities Staffing

# Critical Facilities Staffing

- Matching shift coverage & number of team members to the continuous operation objective
  - Is the goal truly 7x24x365?
  - Are 1-2 unplanned interruptions a year to processing tolerable to the business?
  - Substantial savings if you can wait for team members to drive to the facility during evening or weekend incidents
  - Otherwise, two per shift around the clock is the minimum (9-12 individuals)
  - ***Most data center owners have not clearly matched the continuous operation objective***

# Staffing (continued)



# Staffing (continued)

- Organization structure affects performance
- Facilities team supporting the data center must have:
  - Clear and efficient lines of communication with IT customers (partners)
  - Ready access to funding, directly tied to funding source for IT hardware acquisitions and projects
  - Shared incentives with IT operations team
  - ***Has your organization structure achieved this?***

# Staffing (continued)

- How do you distribute tasks, projects, system ownership, and process ownership?
  - Does your Facilities team collectively address each of these?
  - Or have you assigned ownership of systems, processes, tasks and projects to specific individuals, to balance the workload and make each accountable?
  - ***Ambiguity results in confusion, unaddressed tasks, improperly completed work, and too often, downtime***

# Staffing (continued)

- Each team member should share in *collective* team objectives, such as continuous operation, safety, and training
- Each should be assigned *individual* objectives, as well:
  - Overseeing all maintenance and repairs for an infrastructure system is one example
  - Ownership of a specific process, such as maintaining up to date drawings and documentation, is another

# Staffing (continued)

- Individual assignments instill ***pride of ownership*** and interest in acquiring ***technical expertise*** on the assigned system or process
- A system “owner” should also be tasked with the role as “trainer” for that system

# Staffing (continued)

- Annual objectives must be written, clearly defined, and ***reviewed several times each year*** with each team member
- This level of attention will:
  - Identify a need for additional training or knowledge
  - Identify any unclear objectives
  - Ensure there are no surprises
  - Motivate the individual being reviewed

# Staffing (continued)

- Incentives are important and inexpensive
  - Recognition is worth more than extra pay to most
  - Articles, public thanks, recognition from executives
  - Share some incentives with IT Operations
  - A group reward for an uptime milestone is a compelling incentive for all team members to exercise the same caution
- ***Too many managers fail to provide these***

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# Commissioning

# Commissioning

- Ensure your commissioning (Cx) work includes ***at least***:
  - Factory Acceptance Testing
  - Site Acceptance Testing
  - Systems Integration
- Training and demonstration is an additional phase you may require your Cx agent to perform
- ***Involve your team*** in each phase

# Commissioning (continued)

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# Training

# Training

- Must be ***site-specific***
- Strategic program:
  - Design overview provided by EOR
  - Training provided by system manufacturers
  - Training provided by Cx agent
  - Utilize scheduled PM events
  - Monthly training sessions on emergency responses

# Training (continued)

- Ongoing training should continue for the life of the operation
- Use scheduled PMs involving system transfers to provide each team member experience and confidence
- Only planned monthly sessions will allow your team to be prepared for emergency responses
  - "Classroom" and "in front of equipment"
- ***Most do <u>not</u> conduct ongoing training***

# Practice Time (Training)

- ***Our critical industry is <u>not</u> commonly utilizing this process***
- Compare to:
  - Nuclear submarines
  - Commercial and military aircraft
  - Nuclear power plants
  - Driver education
- A few managers have been savvy enough to schedule 30-60 days after Cx for ***practice*** on system transfers and emergency responses

# Orientation Document (Training)

- Go-to resource for new team members as well as those with tenure
- Typically includes:
  - Team mission
  - Expected behavior
  - Escalation list
  - “Shadow” schedule for new employees
  - Safety policies
  - Infrastructure system descriptions
  - Emergency contact list – support services

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# IT-Facilities Relationship

# IT-Facilities Relationship

- Develop shared objectives and define ownership of separate tasks - in support of continuous operation
  - Network cabling
  - Power cabling
  - Master plan for hardware layout
- Clarifying each group's role in these activities is vital
- ***Most downtime events occur because of errors made in the computer room***

# IT-Facilities (continued)

- Effective power cord labeling

# IT-Facilities (continued)

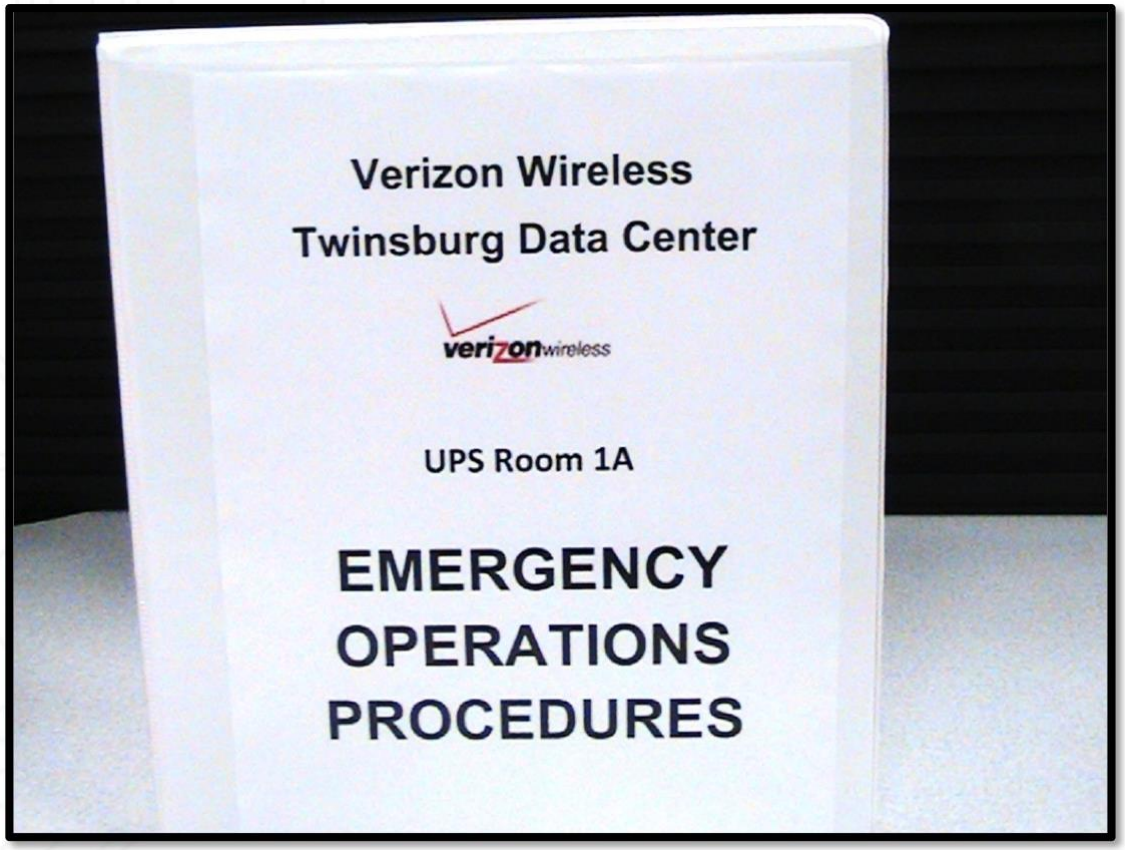
- Restrict access to critical areas
- Minimize number of individuals permitted to install and remove computer hardware and connections
- Define promised response times for each group
- Establish clear understanding of each infrastructure system's capacity
  - Track and report usage (load) monthly

# Data Center Work Rules (IT-Facilities)

- ***Require all*** who set foot in the data center to ***read and sign*** (employees, management, vendors)
- Basic do's and don'ts
- Mundane and otherwise
- Establish and implement just before data center goes "live"
- Requires executive backing
- Examples available

# Procedures

# Procedures


Verizon Wireless
Twinsburg Data Center
verizon wireless
UPS Room 1A
EMERGENCY
OPERATIONS
PROCEDURES

# Procedures (continued)

- PMs: Daily/Weekly/Monthly/etc.: up to 1,000
- System Transfer (isolate and restore): 50-100
- Emergency Response: 50-100
- All must be ***site-specific***
- ***Rarely provided*** as building begins operation

# Procedures (continued)

- Most Facilities teams unable to develop their own System Transfer and Emergency procedures in a timely manner
- Some engage EORs or Cx agents to develop
- Cannot be completed until after Cx
- The vast ***majority of critical facilities operate with only a handful of written procedures***
  - These are typically inconsistent and often incomplete

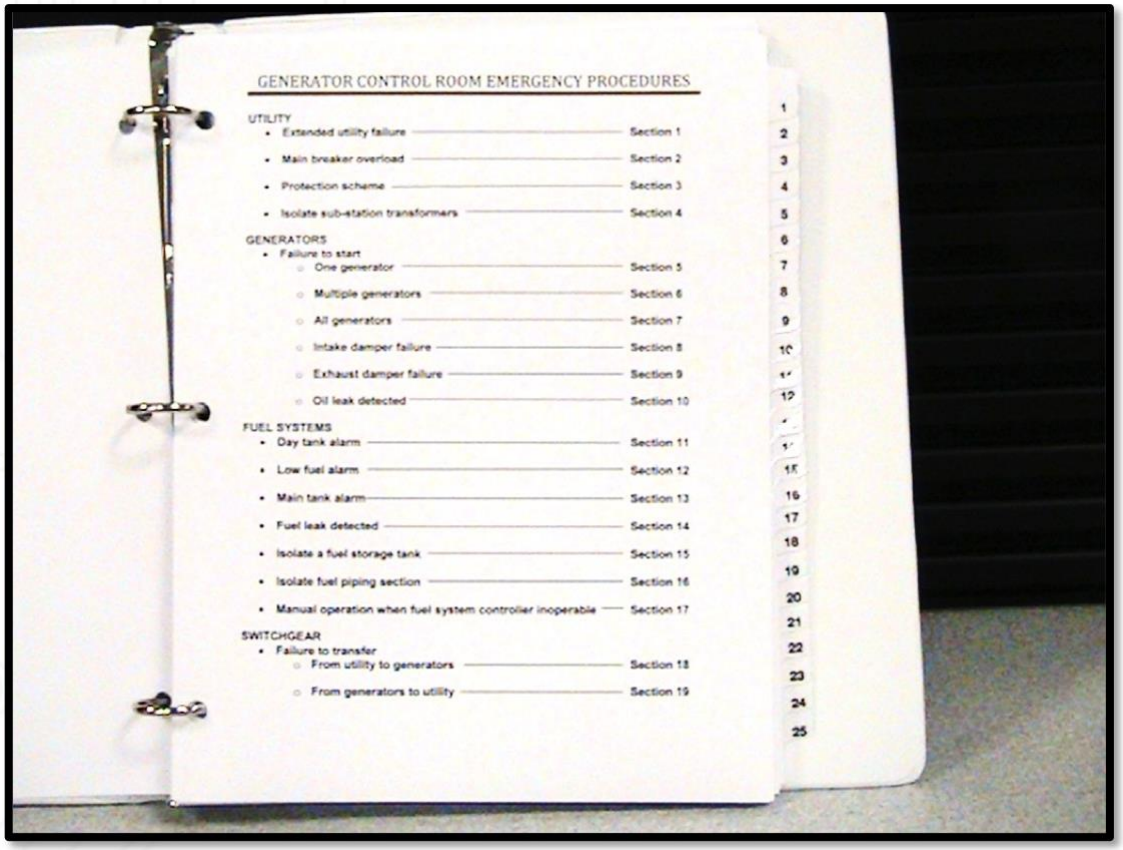
# Procedures (continued)

- Together with training and practice time, a procedures program is your ***greatest opportunity to minimize human error***
- Best practices:
  - Assign ownership to one team member for consistency
  - Provide procedures owner the time to make progress (or the external resources to assist them)
  - Include this role in written objectives
  - Set a timetable for progress

# Procedures (continued)

- Best practices (continued):
  - Establish consistent format & filing structure
  - Include checkboxes for each step
  - Determine designated “expert” for each system
  - “Test” (simulate) each draft procedure for clarity with your least knowledgeable team members
  - Share only PDF copies
  - Place binders with applicable Emergency procedures in each critical room

# Procedures (continued)



GENERATOR CONTROL ROOM EMERGENCY PROCEDURES

UTILITY
- Extended utility failure ——— Section 1
- Main breaker overload ——— Section 2
- Protection scheme ——— Section 3
- Isolate sub-station transformers ——— Section 4

GENERATORS
- Failure to start
  - One generator ——— Section 5
  - Multiple generators ——— Section 6
  - All generators ——— Section 7
  - Intake damper failure ——— Section 8
  - Exhaust damper failure ——— Section 9
  - Oil leak detected ——— Section 10

FUEL SYSTEMS
- Day tank alarm ——— Section 11
- Low fuel alarm ——— Section 12
- Main tank alarm ——— Section 13
- Fuel leak detected ——— Section 14
- Isolate a fuel storage tank ——— Section 15
- Isolate fuel piping section ——— Section 16
- Manual operation when fuel system controller inoperable ——— Section 17

SWITCHGEAR
- Failure to transfer
  - From utility to generators ——— Section 18
  - From generators to utility ——— Section 19

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# Preventive Maintenance (PM) and Spare Parts

# Preventive Maintenance (PM)

- Select an automated PM  program at least a year before construction is completed
- Your team member(s) should program it for PM tasks specific to your facility in the 6-9 months prior to operation
- The program selected should feature automatically generated work orders, late reports, trending, and summaries
- ***Nearly all critical operations utilize these***

# Preventive Maintenance (continued)

- Defining desired PM frequencies should be accomplished by reviewing and weighing:
  - Manufacturers' recommendations
  - EOR's recommendations
  - NFPA, NETA, IEEE recommended practices
  - Your team's experience with similar systems
- Benchmarking demonstrates frequencies for some systems are similar; others widely varied
  - No industry standard

# Spare Parts Program

- Required to ensure timely repairs
- Unique strategy for each site, based on location and systems installed
- Determine which parts manufacturers' service technicians ***do not keep nearby***
- Compare with other critical facilities in your area
- Most Facilities teams ***have not made a comprehensive effort*** at this program

# Spare Parts (continued)

- Provide organized storage space onsite or nearby
- Budget and purchase prior to operation
- Assign ownership to one team member
- Include parts inspection in PM schedule
- Consistently replace and upgrade parts as needed

# Spare Parts (continued)

# Spare Parts (continued)

Creative solutions:

- Permit equipment vendor to house all customer parts in your facility if you have unused space
  - Immediate access when your site needs a part
- Share in the cost of high $ parts with other critical facilities in your area
  - Pool resources and keep one spare
  - Each company chips in when it needs to be replaced
- ***Other solutions?***

# Team Continuity

# Team Continuity

- Performance is optimized through repetition and ***experience gained*** with ***specific systems*** and ***processes*** in a data center
- Each data center facility is ***unique***
- When a team is executing well and each individual is performing satisfactorily, the potential for continuous operation is much higher

# Team Continuity (continued)

- The "***team***" responsible for keeping a data center operating includes ***employees, contracted electricians, design engineers, manufacturers' service technicians, and others***
- Every effort should be made to ***retain the same team*** when continuous operation is the objective

# Team Continuity (continued)

- One unexpected downtime event will easily negate any savings achieved through requiring a bidding process for a contracted service
- Most critical facilities incur an ***impact of hundreds of thousands, if not millions of $*** for each downtime event, when total recovery time is factored in

# Team Continuity (continued)

- Bidding process exceptions for critical facilities should be negotiated by senior management
- Bidding remains an effective option for less critical operations
- A contracted service provider may be replaced over time if price increases are excessive
  - This allows for a careful vetting period and transition to a new provider
  - Only those with stellar service reputations should be considered (thorough references)

# Team Continuity (continued)

Employee team members are more likely to stay when:

- The work is challenging:
  - Cross training
  - Promotion
  - Rotation of responsibilities
- ***Recognition is provided***
- Pay and benefits are slightly higher than the regional average for critical facilities positions

# Team Continuity (continued)

# Team Continuity (continued)

- Every 3-5 years, individual assignments may be swapped between team members who have demonstrated mastery of their original tasks
- A cautious transition should be planned
- Not every team member will be comfortable swapping roles
- Individuals who don’t wish to move outside their “comfort zone” may be content in the same role for many years

# Team Continuity (continued)

- Some will demonstrate an aptitude for leadership
- They may be effective at training others
- Assign “Team Lead” or “Subject Matter Expert” designations to those who merit the promotion
- Separate Team Leads for each shift or for each discipline (electrical, mechanical, etc.)
- Supervisor roles should entail performing or contributing to appraisals

# Assessments

# Assessments

- "As viewed through another's eyes" - the value for routinely assessing your facility
- Recommended every 3 – 5 years
- Validate functional infrastructure system capacities (and remaining room for growth)
- ***Identify single points of failure*** (before they cause surprise interruptions)
- Determine which systems fail to match design objectives (concurrently maintainable, fault tolerant, etc.)

# Assessments (continued)

- Discover Facility Operations and IT Operations shortcomings vs. uptime objectives
  - Downtime for computer operations is caused by ***human error 60-80% of the time***
  - Processes are just as critical as equipment
- Permit each deficiency to be addressed before downtime occurs
- Take credit for effective practices

# Assessments (continued)

- At least 90% of data center facility assessments are *reactive*
- *Pain* generates an immediate concern:
  - *"What else could cause an interruption to processing?"*
- Assessment funding becomes available without question
- ***Can you afford to wait?***

# Assessments (continued)

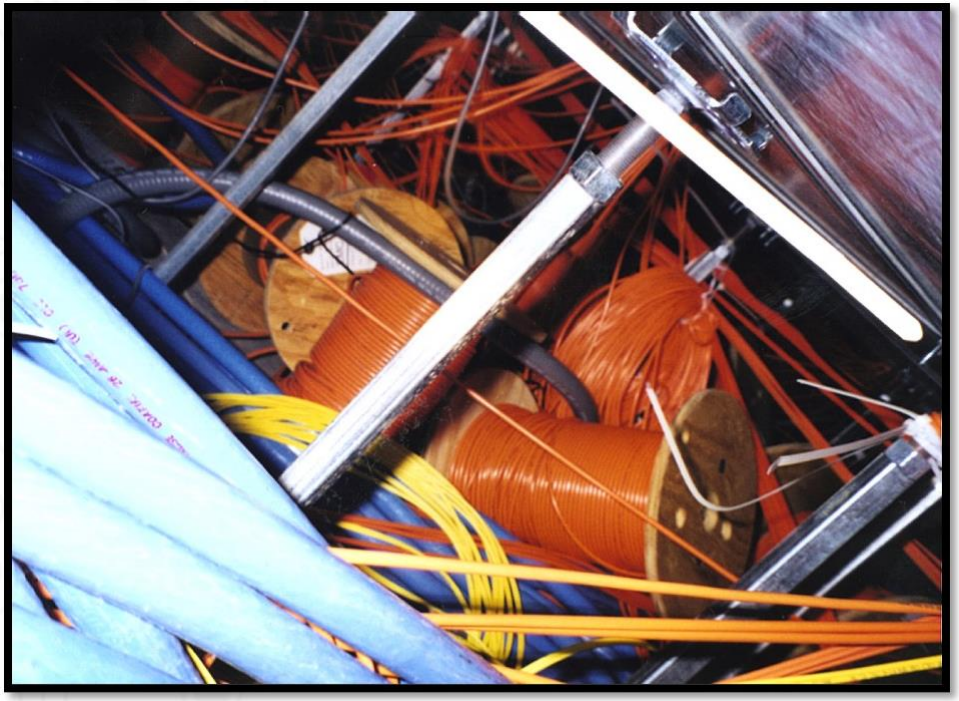
- Internal vs. external assessment team
  - Availability
  - Experience
- Define what will be assessed
- Determine what the report will include:
  - Executive summary
  - List of systems and processes reviewed, with observations
    - Single points of failure
    - Not concurrently maintainable
    - Etc.

# Assessments (continued)

- Statements of remaining useable capacity for each system
- Prioritized recommendations for needed upgrades, modifications, additional processes, etc.
- A list of commendable practices observed

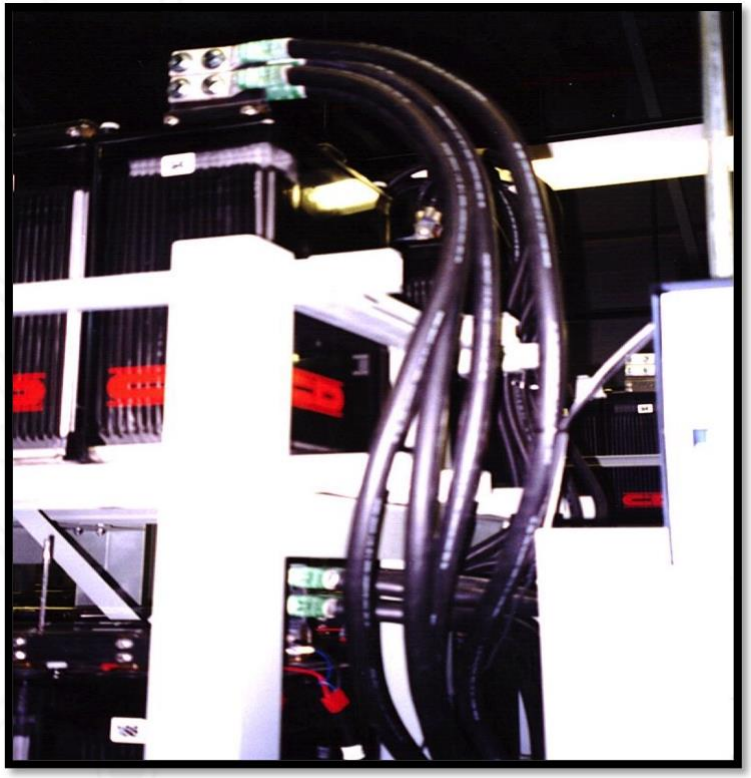
# Sample Assessment Finding

- Sub-floor fire hazards, obstructed air flow, stressed cables and connections



# Sample Assessment Finding

- Improperly supported battery cables



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# Implementation

# Implementation

- A lot of practices to consider
- Review your operation and determine your most significant omissions
- Create a priority list, acquire funding where needed, establish a schedule
- Leverage the fact that ***others are doing this*** when you seek additional resources

# Thank You

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