

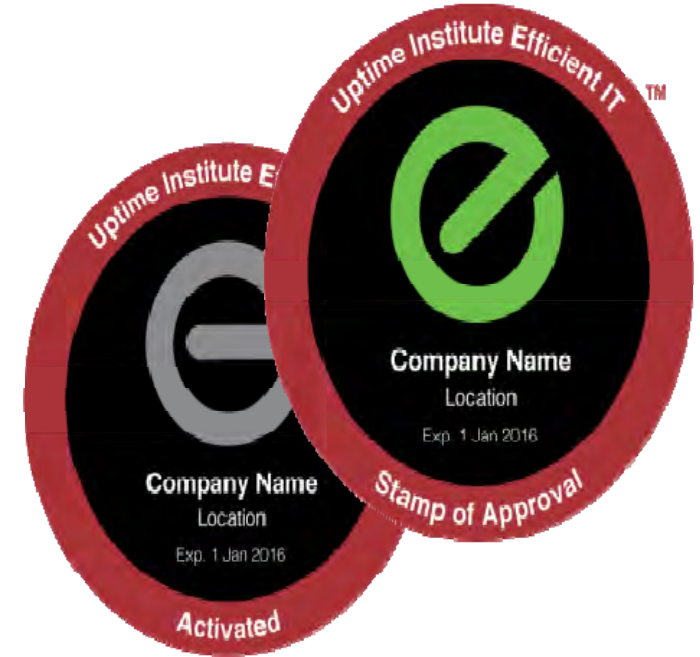
Avoiding Data Center Disasters

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1000+ Certifications in over 70 Countries



UptimeInstitute®
network



Success of a data center project

- Business Objectives or Mission Imperatives drive design (functionality, capacity, capability) of a data center
 - *Tier Standard: Topology*
- Operations management and building traits to avoid downtime are the measure of return on investment
 - *Tier Standard: Operational Sustainability*

<http://uptimeinstitute.com/publications>

Why Uptime Institute Tiers?

- Internationally recognized de facto standard
 - To date, Uptime Institute has awarded nearly 170 Tier Certifications of Constructed Facilities in 43 countries
 - Separated from TIA-942 in March 2014
- Only data center benchmarking system developed by and for data center owners
- Rate a single site, compare two sites, or evaluate a portfolio
- Performance-based fundamental concepts
 - Not a checklist, design menu, or cookbook
 - Encourages innovative engineering solutions
 - Allows for client equipment preferences

Tier Topology Categories

- Tier Classifications represent design topology concepts meaningful in IT
 - Tier I: Basic Capacity
 - Tier II: Redundancy
 - Tier III: Concurrent Maintenance
 - Tier IV: Fault Tolerance
- Fractional “concepts” are not rationalized
 - No Standard for Tier III.6
 - Tier III + is undefined
 - Data center’s Tier Classification based on lowest system rating

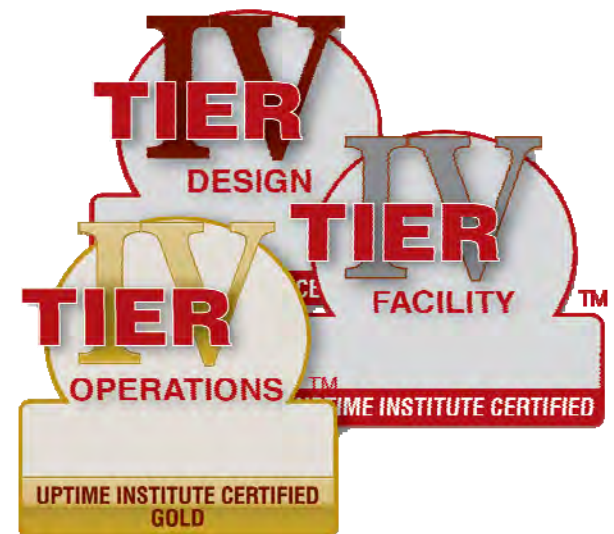
Operational Sustainability

- Complements *Tier Standard: Topology*
- Differentiates the value of investment within a Tier level
- Focuses on the effectiveness of investment over the life of the facility
- Aggregates *Positive* and *Negative* impact of design and management choices
 - Management & Operations processes
 - Built environment
 - Site selection

Tier Certification

- Tier Certification of Design Documents
 - In-depth review of design to ensure full compliance
- Tier Certification of Constructed Facility
 - On-site verification of installed infrastructure
- Tier Certification of Operational Sustainability
 - On-site verification of ongoing operations

Uptime Institute also offers preliminary and progress reviews of designs and operations



Data Center Projects—A longstanding opportunity for improvement

- Since the 1990s, Uptime Institute has been counseling the industry on missteps during the planning and justification stage of a data center
- Industry feedback gathered through the Uptime Institute Network & other owners/operators
- As the ATD program grew to over 1,000 elite engineers, became fluent in the frustrations of the data center design community
- As Tier Certifications expanded, gained insight into hundreds of projects globally

Designers, Owners, and Operators must be able to answer:

- Is the design characteristic a proven performance enhancement?
- Does the building characteristic decrease exposure to human error?
- Do my operations teams and vendors have the organization, training and tools to do their job?

Design, Construction and Operations Misses

Common Commissioning (Cx) shortfalls

- Construction delays push project completion into planned Level 4 and Level 5 Cx schedules
- Lack of independent Cx agent “self certification”
- Not operating on engine generators
- Cx testing regimen
 - Not commissioning to design intent/OPR
 - Focusing on fault scenarios versus maintenance

Not all disasters are immediate

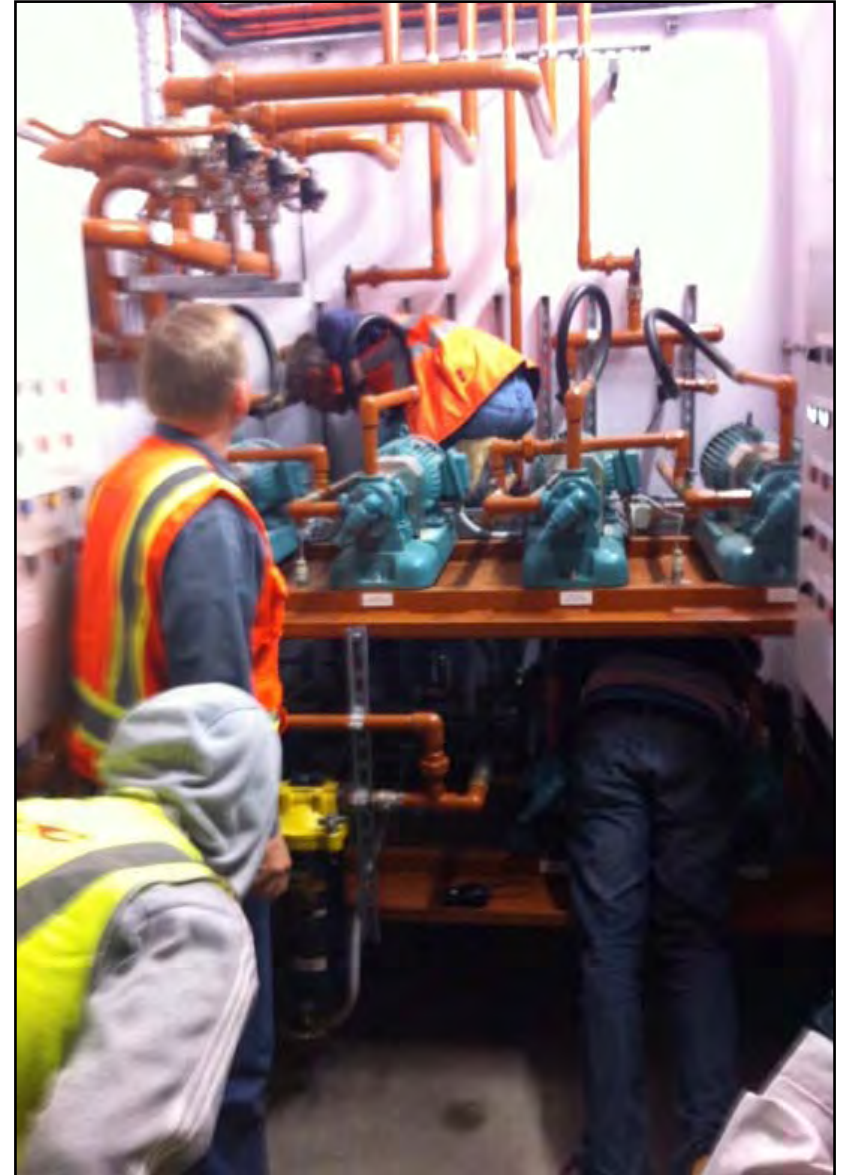
- Value engineering often seen as positive in commercial construction can have serious impacts years later
- Misunderstanding by inexperienced construction teams
 - Do not understand Concurrent Maintainability or Fault Tolerance
 - Focused on getting it done versus a mission critical mentality

Engine-generator controls

- Designed as N+2, Commissioned as N+1
- On isolation of the 2nd redundant engine generator
 - Control system interpreted as a fault condition
 - Opened all output breakers, disabling all engine-generator power
- What was the operations plan?

Not accessible

- Systems was incorrectly installed
- Cx team had to crawl on and over to operate
- Operational Sustainability?



Critical makeup water system?



Material substitutions



Staffing and Organization Significant Findings

- Staffing
 - Inadequate staffing
 - Excessive overtime (over 10%)
 - No escalation process
- Qualification
 - No list of required qualifications
 - No experience with data center specific equipment
- Organization
 - Roles and Responsibilities not documented
 - Data center organization not integrated

Maintenance Significant Findings

- Preventive Maintenance (PM)
 - No list of required PM activities
 - PM activities not fully scripted
 - No quality control process
- Housekeeping
 - Combustibles in the data center
 - No documented housekeeping policy
- Maintenance Management System (MMS)
 - No list of equipment
 - Missing critical data: warranty info, maintenance history, performance data, etc.

Training Significant Findings

- Data Center Staff
 - Undocumented On-the-Job (OJT) programs
 - No formal qualification program
 - No list of training required by position
 - No formal training program with lesson plans, etc.
- Vendors
 - No briefing for escorted vendors

Preventing these problems



Owners recommendations—Design

- Invest time and budget for pre-design, design, CX and operations planning
 - Document IT capacity plan
 - Forecast for now, middle, future scenarios
 - Document facilities requirements
 - Redundancy, resiliency, technology preferences
 - Operations plan
 - Executive briefing
 - How design will incur cost but deliver business value

Owners and owners representatives— RFP and Contractors

- Build project team based upon design intent, technologies, and experience
- Structure contract for mutual success - Align owner and contractor objectives to partner for success
- Sophistication of owner can drive team structure
 - Owners representative role
 - 3rd-party testing and verification
- Establish and manage a communication system
 - Notify of any changes in facilities requirements or IT capacity planning
 - Regularly review any proposed changes by the operation to normal configuration, materials or controls

Operations Recommendations

- Change management is a critical life-cycle function of the data center from design, through construction, CX, and Operations
- Follow Uptime Operational Sustainability model to prevent the common operations missteps:
 - Inadequate staffing
 - Ineffective or non-existing maintenance and training programs
 - Lacking processes and procedures
 - Resulting in the majority of outages being caused by 'human error'

It's a Journey—Not a Destination

- Large enterprise build projects have tremendous risk and complexity
 - Start with a clear project objective, partner with the team through completion
 - Thorough Commissioning by independent 3rd party
 - There are many quality colo and wholesale providers in the North America market
- Operations is unlike other aspects of project development
 - Not a one-time set up
 - Regular assessments must be ongoing
- Certifications are a benchmark, not the destination

Questions?

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