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Mission Critical Product Certification Program

Program Overview

The Uptime Institute (the *Institute*), headquartered in Santa Fe, New Mexico, has pursued the mission of increasing the uptime effectiveness of the mission critical facilities industry since 1992. The *Institute* does this by bringing together end users, computer hardware manufacturers, site infrastructure manufacturers, and consulting engineers in a vendor neutral environment to develop and then disseminate best practices, industry specifications, or guidelines for assuring uptime or reducing downtime risk. One example is the Fault-Tolerant Power Compliance Specification that defines how computer equipment should behave when connected to a site having dual power capability.

The *Institute* also benchmarks uptime effectiveness, performs original research into the causes of downtime and optimal uptime effectiveness, and offers seminars, focus groups, users councils, and other educational programs. As part of its educational program, the *Institute* operates the Site Uptime Network[®] composed of 51 members who operate multiple, large enterprise data centers (many members are Fortune 100 companies). Over the last ten years, Site Uptime Network members have doubled the length of time between site failures by applying the continuous improvement lessons learned through their Network participation.

New technology adoption is a current and continuing problem in the mission critical facility industry. Consulting engineers and end users are apprehensive to purchase or deploy new or redesigned existing products due to the risk of being on the “bleeding edge” and creating unintended site failures. The standard rule within the industry is that new products need at least three to five years of use in a data center setting “somewhere else” before being considered for deployment. As a result, innovation lags and new companies or products never get a chance. With increasing heat load densities and pressures for scalable capital costs and greater efficiency in operating costs, the industry is being continually pushed to do things differently and at a much faster rate.

Site infrastructure manufacturers, computer hardware manufacturers, end users, consulting engineers, and others have approached the *Institute* to see what can be done to reduce risk and speed the adoption of new UPS systems, air conditioning systems, static and relay transfer switches, and similar pieces of complex equipment that are integral to the mission critical facilities industry.

Consistent with these repeated requests, the *Institute* convened and hosted an industry council of leading consulting engineers and end users January 27 to 29, 2003 to confirm the severity of the new technology adoption problem and to investigate interest in and the feasibility of a product certification program. The *Institute* made presentations on proposed methods for accomplishing certification and held roundtable discussions to receive feedback from this representative group.

As a conclusion to these exploratory discussions, the *Institute* further developed ideas and generated this overview for managing and conducting a Mission Critical Product Certification (MCPC) Program. The intent of this Program is to comply with American National Standards Institute (ANSI) guidelines for testing and certifying bodies. The principle tenants of the ANSI guidelines are neutrality, independence, openness, and free access to information by all affected parties including product manufacturers, end users, consulting engineers, and other interested individuals or companies.

Background and History

Mission Critical Facilities Council on New Technology Adoption

The Uptime Institute hosted a Mission Critical Facilities Council on New Technology Adoption January 27-29, 2003 in Santa Fe, NM. The purpose of the meeting was to bring together mission critical data center facility managers, leading consulting engineers, and the *Institute* to

- Identify and discuss problems preventing adoption of new products or new technology that offers the potential of improved site infrastructure performance, reliability, or effectiveness
- Identify the different stakeholders involved in the adoption of new technology and overlapping areas of mutual interest
- Identify what alternatives might be created to reduce the risk and accelerate the appropriate speed of adoption for new products or technology, based on identified problems and potential benefits
- Use American Power Conversion Company's PowerStruXure as a case study to examine specific details for how products in the 3 Phase, 10-100 kW UPS (UPS with integral static switch and self-contained battery intended for installation within the computer room) classification might be evaluated and certified

Consulting Engineer Attendees

- Peter Gross, PE, CEO/CTO—EYP Mission Critical Facilities® Inc.
- William P. "Bill" Mazzetti, Jr., PE, Principal—Mazzetti & Associates Consultants & Engineers
- Richard Schlosser, PE, Electrical Engineer—TiePoint Engineering, PC
- Leo Soucy, Jr., PE—Facilities Engineering Associates
- Robert J. "Bob" Yester, PE, Design Principal—Swanson Rink Consulting Engineers
- Pitt Turner, PE, Principal—ComputerSite Engineering

Data Center Manager and Owner attendees

- Robert A. "Bob" Cashner, Senior Vice President (Corporate Real Estate)—Wachovia
- John Diamond, Director, Facilities Management (National Asset Services)—Cushman & Wakefield
- Paul Marcoux, Vice President (Corporate Real Estate Services)—State Street Corporation
- Robert L. "Bob" Talbot, Former Senior Vice President (Corporate Real Estate, National Engineering)—Fidelity Investments

The Uptime Institute Staff

- Kenneth G. "Ken" Brill, Executive Director—The Uptime Institute
- Paul A. Jorgensen, Certification Program Director—The Uptime Institute
- Marilyn Coon, Communications Director—The Uptime Institute
- Michelle Aucoin Certification Program Manager—The Uptime Institute

American Power Conversion (APC) attendees

- Doug Rademacher, Director of Strategic Initiatives—APC (Monday sessions)
- John McNally, Director of Engineering—APC (Wednesday sessions)

Funding

Funding for the initial Mission Critical Facilities Council and the subsequent development of the Mission Critical Product Certification (MCPC) Program has come from both the *Institute* and American Power Conversion (APC). The *Institute* has agreed to repay APC's seed investment over the first 15 product certifications as the Program becomes financially viable. Other manufacturer sponsors are being solicited for start-up support. While APC's financial support has been essential for bringing the Program to reality, APC's role in MCPC organization and decision-making has been limited. APC representatives attended only the portions of the January Council meeting when the viewpoint of a manufacturer was appropriate. APC has been very attentive and respectful of the MCPC Program's need to be an independent body driven by end users and consulting engineers. Other financial sponsors will need to accept the same conditions of support.

Mission Statement

Accelerate the adoption of new technology and encourage the enhancement of existing technology of mission critical facility products by reducing performance and unintended consequent risks that early adopters face when making purchase and deployment decisions.

Program Goals

Accelerate the adoption of new technology and encourage the enhancement of existing technology of mission critical facility products by:

- Developing and maintaining intent and outcome-based, industry-accepted, product performance evaluation standards applicable to products used in mission critical facilities, utilizing the collective experience and wisdom of recognized industry leaders (end users, consulting engineers, and subject matter experts)
- Conducting a rigorous product evaluation process utilizing independent testing
- Granting uptime certification to products meeting or exceeding industry standards

Program Principles

The Mission Critical Product Certification (MCPC) Program encompasses the following principles that major end users and leading engineering consultants have identified as being necessary to assure that a new or re-engineered product meets the highest standards of performance and product field support thereby reducing their risk in deploying the product.

1. Create intent and outcome-based product performance evaluation standards for different classes of mission critical facilities products.
2. Quantitatively evaluate the performance of products submitted for certification using independent testing and other means to identify engineering, maintenance, or operational shortcomings that may not be initially obvious. This testing is far in excess of what any single user or consulting engineer could hope to perform individually.
3. Evaluate the manufacturer's "whole product" characteristics (see *Crossing the Chasm*), including the full range of customer-related purchasing evaluation concerns such as product support, reliability, manufacturing quality, cost of ownership, etc.

4. Validate actual product performance utilizing manufacturer's published product information supplemented by MCPC performance guidelines.
5. Provide a means to recognize and encourage innovation and enhanced product characteristics that may go beyond minimum mission critical facility requirements in a way that does not limit new product features, characteristics, or performance arising from the use of new materials, concepts, or processes.

Product certification is not intended to duplicate or replace standards created by UL, CSA, IEC or others.

The organizational guidelines and processes under which the *Institute* operates the MCPC Program are vendor neutral, independent, non-discriminatory, and administered in a transparent manner as described in this organizational guidelines document.

Minutes for the initial exploratory Council meeting are available upon request.

Program Organization

The Program involves five organizational elements including The Uptime Institute, a Master Advisory Council, multiple Product Technical Panels, product manufacturers requesting certification, and other interested parties (end users, consulting engineers, product manufacturers, and other interested parties).

The *Institute* will appoint members of the Master Advisory Council (MAC) and the Product Technical Panels (PTP). Members will be selected from end users and consulting engineers with relevant technical expertise and experience to provide an objective process that balances competing interests. Unlike industry organizations that are typically manufacturer sponsored and motivated to develop standards of the lowest common denominator, the MAC and PTP will be raising the performance bar for the mission critical facilities industry by setting a performance standard of concurrent maintainability and "no unintended downtime." Especially at the beginning of the Program, it is unlikely that every product will be able to satisfy every evaluation requirement.

The high level roles and responsibilities for the five organizational elements are outlined below:

The Uptime Institute (the *Institute*)

- MCPC Program management
 - Creates, maintains, and publishes Program organization and processes
 - Creates, maintains, and publishes industry Product Performance Evaluation Standards (Standards)
 - Creates and maintains processes for granting, maintaining, suspending, revoking, or upgrading Uptime Certification
 - Appoints members to MAC and to PTPs (based on nominations from MAC) assuring the appropriate balance of expertise, experience, industry perspective, and continuity
 - Organizes and chairs MAC and PTP meetings as a non-voting member providing administrative support and Program consistency to members
 - Program manages product testing and evaluation using internal and external resources under the direction of the appropriate PTP
 - Grants Uptime Certification
 - Maintains and publishes Product Certification Reports and other public documents
 - Obtains legal counsel and liability insurance for the Program

- Educates the public about the MCPC Program
- Marketing, sales, and contractual interface with manufacturer's undergoing product evaluation and certification
- Administration
 - Develops and audits compliance with internal quality validation processes to assure market acceptance of product certification results
 - Audits transparency, full disclosure, non-disclosure, confidentiality, conflict of interest, and participation by all interested parties
 - Annually conducts 360° surveys of end users, consulting engineers, and manufacturers to assess the success of MCPC Program

Master Advisory Council (MAC)

- Advises the *Institute* on MCPC Program Level Standards
- Nominates Product Technical Panel members
- Reviews work products of Product Technical Panels and recommends to the *Institute* acceptance of PTP recommendations
- A MAC member serves on each PTP

Product Technical Panel (PTP)

- Develops Product Standards, solicits Industry input (interested manufacturers may be requested to participate as non-voting panel members during the Standards development process), develops proposed and final industry Standards for recommendation to MAC. Part of each Standard will be bonus points for enhanced features or superior performance beyond the minimum expectations of the mission critical industry
- Develops product evaluation plan for manufacturers requesting certification. Oversees the *Institute* staff project managing and/or conducting product evaluation and testing efforts
- Reviews evaluation results, evaluates whether bonus points were earned, and recommends product certification to MAC

Product Manufacturer(s)

- Agrees to MCPC Program rules (this may include a notice of limited certification liability that appears on their invoice to buyers of certified products)
- Submits product information for evaluation
- Submits reliability analyses and data and "whole product" information
- Provides representative products and testing facilities for verification of functionality and performance
- Reviews and comments on draft Product Certification Report
- Requests publication of final Product Certification Report

Other Interested Parties

- Communicates with the *Institute*, MAC, and PTPs on industry needs and matters of Program philosophy, principles, Standards, and processes
- Supports certification program concepts and philosophy through education

Quality System

The Executive Director of the *Institute* will have overall responsibility for developing, managing, and auditing ongoing quality assurance processes. The quality assurance document will formally state the *Institute's* commitment to quality throughout all aspects of the Program and will outline active measures to ensure that this policy and its objectives are understood, implemented and maintained at all levels within the *Institute* and the MCPC Program.

The quality assurance document will define objectives for

- Organizational principles
- Conduct of meetings
- Adherence to professional standards of conduct
- Staff competence
- Testing and evaluation methods
- Processes for soliciting industry comment
- Handling of appeals, complaints, and disputes
- Public disclosure

Program Documentation

A formal documentation system will be established and updated at regular intervals making the following information available through publications, electronic media, or other means or upon request:

- Information about the organization and guidelines under which the Mission Critical Certification Program operates.
- Information about developing, updating, and formally issuing industry Product Performance Evaluation Standards.
- Information about the testing and evaluation process leading to product certification.
- Information regarding rules and procedures for granting, suspending, revoking, or upgrading product certification.
- Information on procedures for handling complaints, appeals, and disputes.
- A description of the means by which the Program obtains financial support and general information on the fees charged to manufacturers.
- A description of the rights and duties of applicants and manufacturers earning product certification. This includes restrictions or limitations on the use of the Uptime Certified Trademark and restrictions or limitations on use of certification in promotional literature or other communications.
- A directory of products receiving certification including product description, scope of certification, and the published results of the testing and evaluation.

The *Institute* shall establish and maintain procedures to control all documents and data that relate to its MCPC functions. These documents shall be periodically reviewed and approved for adequacy by appropriately authorized and competent personnel prior to issuance or prior to releasing any subsequent amendment or change. A listing of all appropriate documents with the respective issue and/or amendment status identified shall be maintained. The distribution of all such documents shall be controlled to ensure that the current and correct documentation is

made available to MCPC Program personnel, to prospective manufacturers requesting product evaluation, and to interested third parties.

Granting, Maintaining, Suspending, Revoking, or Upgrading Product Certification

Granting Certification

Following completion of the product testing and evaluation by the PTP, review by the Master Advisory Council, and granting of certification by the *Institute*, The Uptime Institute will provide artwork and other materials to allow the use of the Uptime Tested trademark and the listing number for use in the manufacturer's product literature and nameplates. Documentation including the formal Certification Test Report and the level of certification shall be publicly available through the *Institute* website, publications, and other means.

Certificate Of Certification

The *Institute* will provide the manufacturer with a formal certificate of certification.

Maintaining Certification

Continued use of the Uptime Tested trademark requires that the vendor submit records and other documents on a timely basis indicating continued compliance with the applicable industry Standard under which the product has been certified. Maintenance of product certification will be dependent on the regular receipt of reliability data and other performance related data as required by the Standards. Failure to provide this data as per the defined basis, or field indications that actual performance or reliability is not consistent with the applicable Standard or the evaluation and testing was faulty shall be grounds for certification suspension.

Certification Suspension

Product certification suspension may occur for any of the following reasons that clearly indicate that the product no longer meets the intent or performance required by the Standards:

- The manufacturer fails to comply with regular on-going reporting processes or these reports indicate changes in product design, reliability, or other whole product characteristics.
- Field reports from end users (which can be reasonably substantiated) indicate material changes in reliability, design, or other whole product characteristics.
- Certification may be suspended if maintenance fees for on-going certification compliance monitoring are not current.

Certification Revocation

Revocation of a previous certification may occur within the 90 days following suspension if corrective actions have not been taken to correct deficiencies identified in the suspension.

Certification Upgrade

A manufacturer may elect to resubmit its product for re-evaluation to achieve a higher level of certification (Silver or Gold) than initially achieved. This is consistent with a Program goal encouraging continuous product improvements and enhancements as well as ongoing improvements to whole product characteristics such as reliability. Recertification applications will be considered on an individual basis and may be limited to evaluating only the improved portion of the product.

Commercial and Financial Considerations

Fees for Certification

The processes described in this and related documents are a fee service wholly paid for by the manufacturer seeking certification.

Fees for product certification shall be determined based on a uniform method that accounts for the cost of developing and maintaining Product Performance Evaluation Standards, performing product evaluation and testing, Program management costs including maintaining the MAC and PTPs, an allowance for contingencies, amortization of start-up costs, and for the *Institute's* overhead and administrative costs.

The fee structure shall be based on:

- A pricing model yet to be determined.

Certification fees shall be payable in the following schedule:

- Application. Ten percent (10%) of the estimated fee shall be payable upon initial application and acceptance of the terms and conditions provided in the *Institute* fee proposal.
- Pro-forma Product Evaluation. Twenty percent (20%) of the estimated fee shall be payable in advance for a pro-forma product evaluation utilizing information submitted with the product application.
- Product Testing and Evaluation. Sixty-five percent (65%) of the estimated fee to perform product evaluation and testing. Additional fees may be charged if tests or evaluations must be repeated because of failures or erroneous or inadequate information.
- Certification Publication. The balance of the fee is due following completion of evaluation and prior to publication of final evaluation results.

Certification Maintenance Fee

Maintenance of Product Certifications requires an annual fee to provide Program follow-up to assure continued manufacturer adherence to Standards. In some cases the Product Performance Evaluation Standards will require a continuing forum for reporting actual field reliability. Maintenance fees shall be determined based on the complexity of the effort.

Reimbursement for Master Advisory Council Members

Members of the Master Advisory Council provide services mostly on a volunteer basis receiving a modest annual stipend of (to be determined). Reimbursement for reasonable travel expenses will be provided as required.

Reimbursement for the Product Technical Panel Members

Members of the Product Technical Panels provide services mostly on a volunteer basis receiving a modest annual stipend of (to be determined). Reimbursement for reasonable travel expenses will be provided as required. In instances where members of the PTP also perform witness testing or perform actual product evaluations, these activities are compensated at current industry professional rates.

Indemnification of Employees, Officers, and Council/Panel Members

The Uptime Institute shall indemnify each of the individuals involved with and responsible for operation of the Mission Critical Product Certification Program to the fullest extent permitted by applicable laws and provide liability insurance against lawsuits or expenses incurred by such persons in connection with this Program.

Confidentiality

The Uptime Institute shall provide adequate arrangements, consistent with applicable laws, to safeguard the confidentiality of manufacturer information obtained in the course of its MCPC Program activities, including at all levels of its organization and external councils, committees, panels, bodies or individuals acting on its behalf. In addition, it is of utmost importance that results of the testing and evaluation process remain confidential until the final Product Certification Test Report is published. The *Institute* will be responsible for all public dissemination of MCPC Program information, Standards, and evaluation results.

Except as required by law, confidential information about a particular product or manufacturer shall not be disclosed to any third party without the written consent of the manufacturer. Where the law requires that information be disclosed to a third party, the manufacturer shall be informed of the information provided, as permitted by the law.

The members of the MAC and PTPs shall execute a non-disclosure agreement (NDA) with The Uptime Institute specifically preventing public disclosure of internal MCPC discussions (except those disclosed separately in meeting minutes) and technical or proprietary design details relating to a product submitted for evaluation, or learned during the evaluation process.

Conflict of Interest

It is the responsibility of Council and Panel members and *Institute* Program staff to disclose to the Executive Director of the *Institute* any personal or corporate interest they may have in any company that applies for certification unless the connection is via a mutual or other fund managed by a third party not under the control or influence of the member. Conflicts shall be discussed by the Executive Director with the Master Advisory Council. Members with a conflict shall recuse themselves from participating in any action that directly relates to the company with which they have a connection.

The *Institute* Executive Director shall not appoint a member to a PTP who has a financial interest through ownership of stock (unless the connection is via a mutual or other fund managed by a third party not under the control or influence of the member) or other means in any manufacturer who may reasonably be expected to be a potential applicant for product certification.

The Executive Director shall have the responsibility and authority for investigating and determining whether a MAC or PTP member or *Institute* Program staff has a conflict of interest and then to ensure that the MAC or PTP member is recused from voting in matters having conflict or conflict potential.

All decisions on product certification and the certification level will be made by the Master Advisory Council based on recommendations from the Product Technical Panel.

Appeals, Complaints, and Disputes

The following procedure shall apply to all appeals, complaints, and disputes:

All appeals, complaints, or disputes shall be submitted in writing and directed to the Executive Director of The Uptime Institute. These will be acknowledged in writing within 10 working days after receipt and put before the Master Advisory Council or the applicable Product Technical Panel within 30 days. The MAC or applicable PTP will review all comments and suggestions from interested parties on an impartial basis. The MAC or applicable PTP will vote on acceptance of any comment or suggestion within the context of the Program Mission Statement, Mission Goals, and Principles that have been established. The MAC or PTP will provide a reply and/or recommended response within the subsequent 30 days.

The *Institute* will maintain a record of all appeals, complaints, and disputes relative to Product Performance Evaluation Standards or product certification and make them available on request by any interested party.

All interested parties who may have an industry interest in MAC or PTP activities, including potential vendors, end users, or government agencies, shall have an opportunity to comment on proposed or final industry Product Evaluation Standards and on product certification granting, suspension, or revocation decisions.

Changes to Existing Industry Product Performance Evaluation Standards

The Product Technical Panels shall review all standards on a 12-month basis to determine currency of the industry evaluation needs and to solicit at least every three years suggested changes or corrections to the Standards from industry and other interested parties. The Panel shall review such proposed changes and recommendations to create proposed revisions for review and approval by the Master Advisory Council and the *Institute* within six months of the recommendations. Notice of changes to existing Standards shall be sent to manufacturers of previously certified products.

All changes to Product Performance Evaluation Standards shall be designated with a revision level and an effective date.

Manufacturers may elect to resubmit their products for certification to the latest standard revision level. Products certified to later revisions shall be designated as having met the later standard.

Organizational Processes

Appointment of Members to Master Advisory Council and Product Technical Panels

The Executive Director of the *Institute* will appoint up to ten voting members to the Master Advisory Council. Members will be selected from end users and consulting engineers to provide relevant technical expertise and experience and to provide an objective process that balances competing interests. The non-voting chairperson of the Council shall be the Executive Director of the *Institute* or his designated Program representative.

The Executive Director of the *Institute* will appoint between three and five voting members to each Product Technical Panel. The non-voting chairperson of the Panel shall be the Executive Director of the *Institute* or his designated Program representative. One panel member will always be from the MAC. The PTP shall always include an odd number of voting members.

Tenure

Members of the MAC and PTP shall be appointed to three-year terms except during the initial three-year period. During the initial three-year period, members shall be designated to have terms of one, two or three years. At the expiration of a MAC member's term, the *Institute's* Executive Director may reappoint a member in good standing for a second three-year term or may appoint a new member for a three-year term. Upon resignation of a MAC member, the Executive Director will appoint a new member to fill out the remaining portion of the resigned member's term. At the expiration of a PTP member's term, the Executive Director may, upon the advice of the MAC, reappoint a member in good standing for a second three-year term or may appoint a new member for a three-year term from MAC nominations. Upon resignation of a PTP member, the Executive Director will consult the MAC for nominations and appoint a new member to fill out the remaining portion of the resigned member's term.

Meetings

The MAC and each PTP will meet either by conference call or in person on a regular basis. The chairperson shall determine the agenda and order of business for each meeting. Agendas shall be available three business days in advance of regularly scheduled meetings.

Meetings shall be of two types: informal general discussions and formal activities during which votes are taken. All discussions on official adoption of standards, certification of products, and issues of appeals, complaints, and disputes shall be held during the formal portion of the meeting. Meeting minutes shall be prepared and provided to members. Minutes of the formal portion of meetings shall be available to interested parties upon request.

Roberts Rules of Order shall be followed during the formal portion of meetings when votes are taken on specific standards, determination of evaluation processes for any particular evaluation activity, determination of bonus points and advanced certification level, and the granting of certification.

The adoption of Standards, changes to existing Standards, consideration of industry comments, granting of certification, and other related decisions require recorded votes of the PTP and MAC. Members who are not in physical attendance may vote verbally by phone and confirm their vote by e-mail within one day of the voting. Quorum shall be 60% plus one of the confirmed and active members. Decisions on issues shall be a simple majority of the quorum plus one vote.

Certification Process Outline

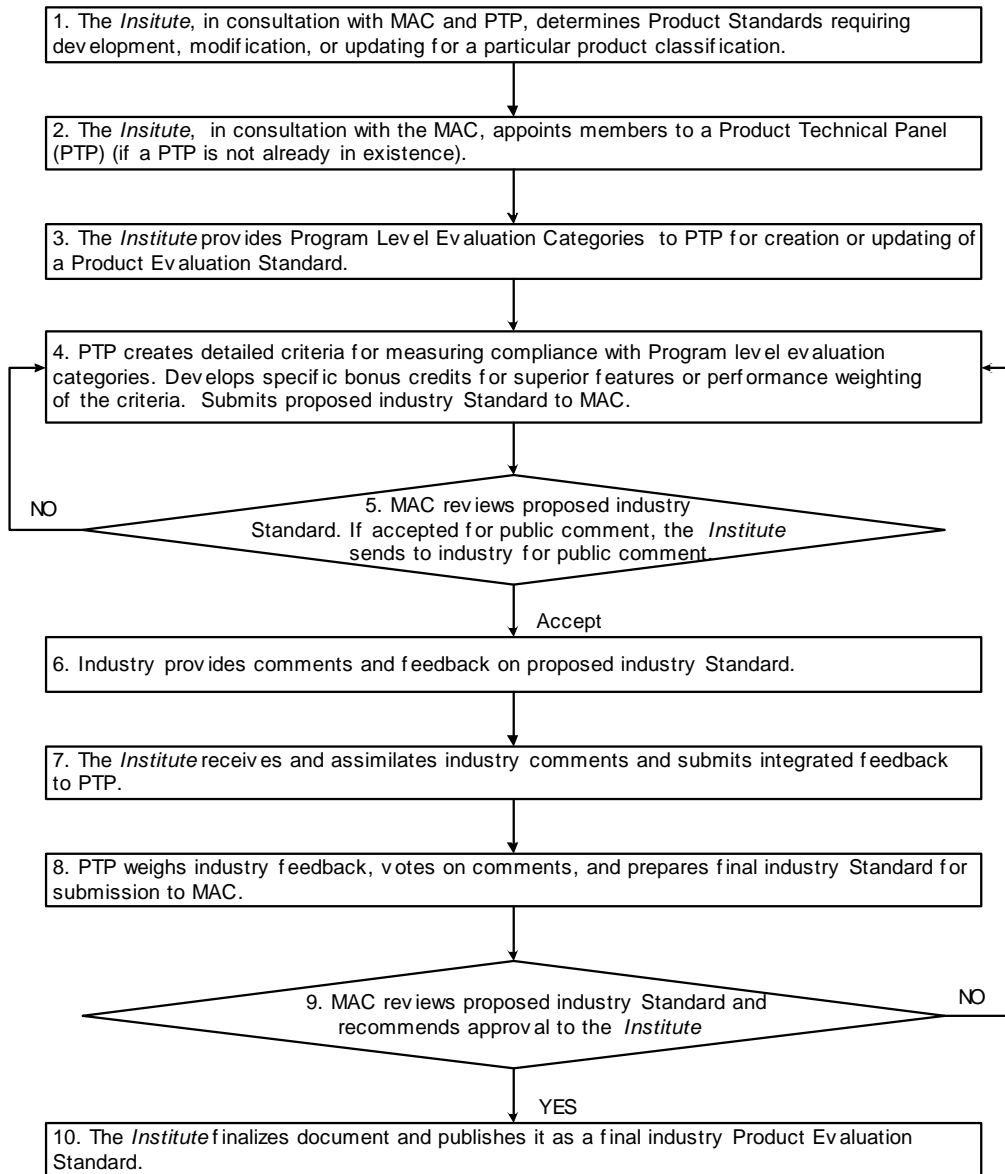
Product Performance Evaluation Standard Development and Promulgation

Formally issued final Product Performance Evaluation Standards and other Program documents are available from the *Institute*. The portion of MAC and PTP meeting minutes concerning Product Performance Evaluation Standard development and approval are also publicly available. A listing of available Standards (proposed and final) and other Program documents will be posted on the *Institute* website. The following narrative description of the process for developing and issuing a Product Performance Evaluation Standard is flowcharted in Figure 1.

1. The *Institute*, in consultation with MAC and PTP and interested parties, will determine which product classifications require development of Product Performance Evaluation Standards. Depending upon funding being available, a PTP shall be appointed for each product classification for which a Standard is required. A single panel may have responsibility for more than one Standard if they are subparts of a single product type that requires unique standards due to variations in size or configuration.
2. The *Institute*, in conjunction with nominations from MAC, appoints three to five voting members to each PTP with the non-voting Panel chairperson being the *Institute's* MCPC Program representative. One panel member will always be a MAC member. The PTP shall always include an odd number of voting panel members.
3. The *Institute* will provide a draft Product Performance Evaluation Standard with approved Program evaluation categories and suggested criteria for further refinement and development by the PTP.
4. The PTP develops specific Product Performance Evaluation Standards with detailed criteria, type test requirements, prerequisites, certification point weighting, and specific credits for enhanced features, enhanced performance, reliability, or innovation. The MAC representative on the PTP should be consulted by other PTP panel members for guidance to ensure consistent application of Program philosophy and principles.

5. MAC reviews PTP's draft of a proposed Product Performance Evaluation Standard and recommends acceptance to the *Institute*. If changes to the draft are required, the MAC representative to the PTP will consult with the other PTP members to determine a resolution to MAC concerns.
6. Upon the *Institute* approval, the PTP's Product Performance Evaluation Standards draft is converted to the format of a proposed industry Standard. The *Institute* sends the proposed Standard to affected manufacturers, industry leaders, and interested parties for comment with a letter of explanation and instructions on how to respond/participate in a discussion of criticisms or changes to the proposed Standard.
7. The *Institute* receives industry comments from product manufacturers, industry leaders, and other interested parties and assimilates them into meaningful comment documents for review and subsequent voting by the PTP.
8. The PTP reviews industry comments and incorporates appropriate changes into the proposed Standard.
9. The proposed Product Performance Evaluation Standard goes to MAC for final review and final recommendation to the *Institute* for approval as a formal industry Standard. If the proposed Standard is not accepted, MAC provides feedback to the PTP and the document goes back to PTP for revision.
10. The *Institute* publishes the formal industry Product Performance Evaluation Standard on its website.

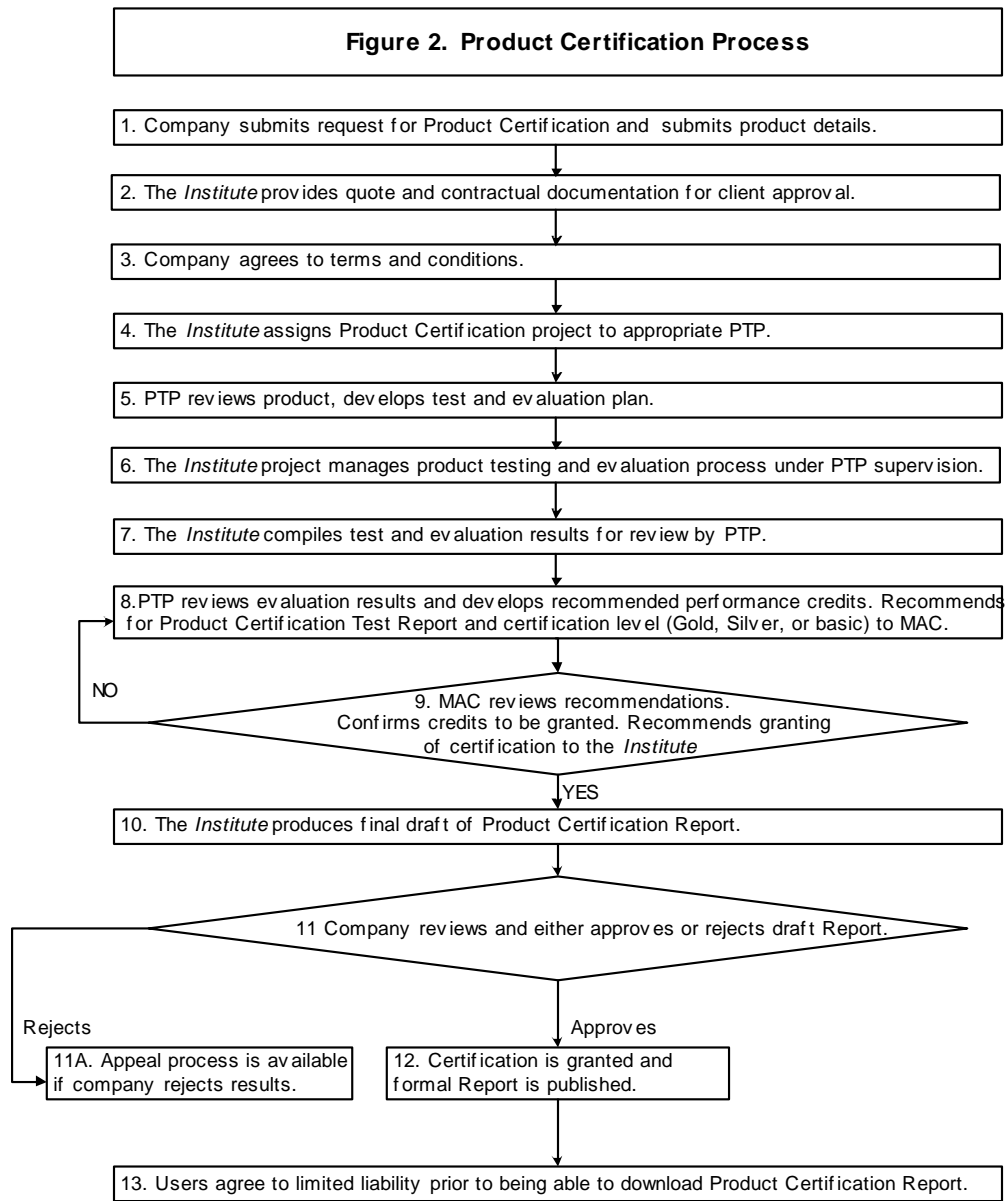
Figure 1. Product Evaluation Standard Development and Industry Promulgation



Product Evaluation and Certification Process

The following narrative describes the process of evaluating and certifying a product. This process is flowcharted in Figure 2.

1. Companies wishing to have their product certified shall submit a letter of intent to the *Institute* including product information details. Products requiring the development of a new Product Performance Evaluation Standard will take longer to be certified than ones with existing Standards.
2. The *Institute* provides a product evaluation quotation, schedule, and a certification contractual agreement for approval by the product manufacturer. Part of the quotation may be for the development of a Product Performance Evaluation Standard if one does not already exist, or is out of date.
3. Manufacturer agrees to costs and to contractual terms and conditions.
4. The *Institute* assigns the project to the appropriate PTP.
5. The PTP reviews the product application, and if required, develops or updates the Product Performance Evaluation Standard. The PTP develops an evaluation and test plan and approves the *Institute* evaluation team. If requested, the PTP may perform a preliminary pro-forma prediction of the likely outcome of product certification evaluation based on data provided by vendor.
6. The *Institute* manages product evaluation projects under PTP support and oversight using internal and external resources (the *Institute* will engage consultants and industry experts as required to assist in performing some or all of the evaluation and testing tasks). Tests are conducted at either the manufacturer's site or at an independent testing facility. PTP members may witness some or all tests.
7. The *Institute* processes evaluation results and compiles them into a draft Product Certification Report for review by PTP.
8. The PTP reviews evaluation results and revises or corrects the draft Product Certification Report. The PTP provides recommendations on whether the incremental bonus points for superior performance have been earned and the resulting level of certification (basic, silver, or gold).
9. The MAC reviews the draft Report and the PTP recommendations. The MAC either approves the draft Product Certification Report and recommends the granting of certification to the *Institute*, or returns it to the PTP for further study or changes.
10. If the draft Product Certification Report is recommended, the *Institute* accepts the recommendation and produces a final draft of the Product Certification Report and submits it to the product manufacturer for its review and approval.
11. The product manufacturer reviews final draft of the Product Certification Report and either approves it, or rejects it.
- 11A. If the manufacturer rejects the findings of the final draft Product Certification Report, the results are not published and no details are disclosed publicly. An appeal process is available in the event of disagreement. The *Institute* documents and resolves all administrative issues.
12. If the manufacturer accepts the findings, the *Institute* grants product certification and the formal Product Certification Report is published and available on the *Institute's* website.
13. Prior to being able to download the formal Product Certification Report, users must agree to accept the *Institute's* limited certification liability.



Terminology

ANSI American National Standards *Institute*: ANSI is the U.S. member body of the International Organization for Standard (ISO) and of the International Electrotechnical Commission. Its mission is to support the emerging need for product certification and to provide single experiences source for accreditation in the United States. ANSI has established criteria to govern the accreditation of certification bodies and product certification systems.

BOCA Building Officials and Code Administrators International, Inc.

Certification The process described within this document to evaluate and test products in accordance with industry accepted standards.

Certificate of Certification A document provided by The Uptime Institute to a manufacturer who submits a product for evaluation, the time for which it is certified, the certification standards to which it was tested, and the conditions under which it was certified.

Certification Maintenance Fee A fee paid on a regular basis to The Uptime Institute to maintain certification level and comply with reliability and quality reporting requirements.

Consulting Engineer Professional Registered Engineer specializing in the Mechanical, Electrical and Plumbing aspects of Mission Critical Facilities design.

CSA Canadian Standards Institute: an organization with a similar mission as UL, but operated within Canada.

End User Company owning or operating a major enterprise data center of greater than 20,000 square feet with a mission critical uptime requirement.

ETL Electrical Testing Laboratories.

Evaluation Categories Each industry Standard must include all ten MCPC Program Level evaluation categories. Each evaluation category has a paragraph description of a specific intent or outcome which is customized by the PTP with additional detailed criteria for measuring whether the category has been satisfied by the product being evaluated.

IEC International Electrotechnical Commission: a worldwide organization for standardization that comprises all national electrotechnical committees whose objective is promoting international cooperation on all questions concerning standardization in the electrical and electronic fields.

IEEE Institute of Electrical and Electronic Engineers.

Institute The Uptime Institute: an independent organization specializing in increasing the uptime effectiveness of the mission critical facilities industry.

Listing Number File number issued by The Uptime Institute that refers to a specific Product Certification Test Report

MAC Master Advisory Council: a Council organized by the *Institute* and made up of representatives of the mission critical industry who advise, guide, and vote on the development of Standards and on granting product certification based on the results of product evaluation testing.

MCPC Program Mission Critical Product Certification Program: an industry Standards development, product testing and certification Program operated by The Uptime Institute for the benefit of the mission critical facilities industry.

MTBF Mean Time Between Failures.

MTTR Mean Time To Repair.

NEC National Electric Code.

NFPA National Fire Protection Association.

Program Documentation All information, minutes, standards, and relevant technical information related to the operation and organization of the Mission Critical Product Certification Program.

PTP Product Technical Panel: a panel responsible for developing proposed and final industry Standards and for overseeing the testing and evaluation of products against those standards.

Report Product Certification Report: report prepared by a Product Classification Panel in conjunction with the *Institute* on the results of product testing and evaluation against industry Standards. Report is reviewed and accepted by the Master Advisory Council and then accepted by the manufacturer.

Site Infrastructure Refers to the mechanical and electrical subsystems that together comprise the environmental systems portion of a mission critical facility.

Standard Product Performance Evaluation Standard: an industry standard for objectively defining mission critical concurrent maintainability and fault tolerance product performance expectations.

UBC Uniform Building Code.

UL Underwriters Laboratory: an independent product safety testing and certification organization that specializes in product safety testing, which operates principally within the U.S.

Uptime Certified™ The graphic symbol trademarked by The Uptime Institute, which may be applied to products and literature that indicate that product has met specific product certification standards.

Product Performance Evaluation Categories

The MCPC Program has developed ten Program level categories for performance evaluation that must be considered when granting product certification. These generic categories are the starting point for the Product Technical Panels in developing industry Product Performance Evaluation Standards. Within each category, the PTP must create additional sub-criteria for what constitutes category compliance. Compliance will include minimum mission critical requirements that every product must meet. Bonus points may be earned for innovation or enhanced product characteristics, features, or performance that go beyond basic mission critical requirements and standard functional type tests.

The generic evaluation categories that PTPs start with when developing new Performance Evaluation Standards are divided into two groups:

- “Whole Product” (See the book, *Crossing the Chasm*) characteristics. These categories are related to how the product interfaces with its surrounding environment (installation, codes, remote interfaces, etc.), to the cost of ownership, reliability, and issues related to after-the-sale service and support. The contents of these categories tend to be common to many product classifications with minimal changes.
- Quantitative characteristics that can be subjected to functional and performance quantitative testing. These tend to be significantly different and unique for each product classification.

“Whole Product” Evaluation Categories

- 1.0 Installation. Verify the product can be easily installed. Verify the manufacturer’s installation documents are complete, the installation methods are workable, and that no unusual tools, procedures, or installation labor are required.

- 2.0 Codes, Standards, and Specifications. Evaluate the product against recognized codes, standards, specifications, and industry practices that include ANSI, IEC, IEEE, NFPA, and typical building codes and construction specifications. This evaluation is not a replacement for safety certification by ETL, CSA, or UL.
- 3.0 Reliability and Analytical Evaluation of Single Points of Failure. Evaluate the product's design from a reliability perspective focusing on single points of failure and how those risks are minimized by the manufacturer's design or selection of components. Perform a desktop analysis of how the product is likely to react to normal configuration changes, operator mistakes, boundary conditions outside the product's tolerance, and normally expected component failures. Review the product's likely reaction to boundary conditions that are outside the product's tolerances or to unplanned changes in configuration, abnormal configurations, operator error, or component failure. Develop test scenarios to confirm analysis as part of Category 10. Develop prediction of expected MTBF and compare with manufacturer records for actual product field failure performance.
- 4.0 Human Factors. Validate the product's operator and maintenance interface meet current best practices for human factors engineering and design. [Human factor problems have been associated with a very significant percentage of data center outages identified by the Site Uptime Network's® Abnormal Incident Reports.] Validate functional control convenience, use of clear and consistent labeling, and other human factor design issues intended to minimize or prevent mistakes or failures resulting from human interaction or product response to human changes in configuration.
- 5.0 Operation and Maintenance. Validate ability to perform routine product setpoint/functional selections or operational changes, routine maintenance, and routine repair or modification activities while the product is operating for issues of personal safety and whether the work can be successfully accomplished without unplanned risk downtime. Identify the skill level required of the operator or technician to successfully perform these functions. Confirm service footprint. Consult technicians who have actually used the product to validate operation and maintenance functions. Review the MTTR for non-routine maintenance, repair, or upgrade functions.
- 6.0 Whole Product Experience. Review the manufacturing facility and the associated manufacturing documentation, controls, test processes, and quality control procedures. Validate the manufacturing and quality processes happen as described. Validate the manufacturer has a field service organization that is capable of servicing and repairing the product in a timely manner. Review the service organizations procedures and escalation processes. Identify and report where qualified service personnel are located for this product. Validate the processes work. Determine if the manufacturer tracks product field failures and has a process for informing customers of product performance enhancements or reliability problems. Determine if the product's firmware will be made available in the event of manufacturer failure.
- 7.0 Local and Remote Management Software. Review the functionality of monitoring or management software including capability to interface with different building management systems. Claims for "openness" and reporting capability are validated.
- 8.0 Cost of Ownership. Quantify the total cost of ownership including initial first cost and life-cycle cost on total cost per delivered kW or ton, cost per square foot, and energy efficiency at partial and full load as well as return on investment at different rates of return. Operating costs to be included in the life-cycle cost modeling are energy (energy for the product itself and the energy for removing heat generated by the product), other utilities, routine maintenance, life-cycle parts replacement and repair costs (specifically battery replacement if gel cell batteries are employed). Capital costs will include the

installed product cost, the cost of the service footprint space, and recommended spare parts. The underlying calculation methodology and data used will be published so prospective owners can perform their own calculations using their own financial metrics. A qualitative element in the cost of ownership is scalability if loads grow beyond expectations or ease of redeployment if the load fails to develop.

Evaluation Categories Addressed Quantitatively

Validate that the product meets or exceeds the manufacturer's published documentation as well as the unique functional or performance requirements of mission critical facility service. The Product Technical Panel composed of industry experts will use their intimate knowledge of the product type being evaluated to identify the detailed testing program. Actual testing will be independently performed at a recognized laboratory or at the manufacturer's facility using recently calibrated instruments.

The objective of quantitative testing is to take as much risk as possible out of adopting new technology by identifying engineering, maintenance, or operational shortcomings that may not be initially obvious. The testing will be far in excess of what any single user or consulting engineer could hope to perform.

Quantitative performance evaluation categories are divided into two sections.

- 9.0 Testing to Validate Manufacture Claims, Electrical Rating, and Published Specifications. Independently validate the accuracy and completeness of all published product specifications and claims. Testing shall be performed at a recognized laboratory or the manufacturer's facility by independent, competent evaluators using recently calibrated instrumentation.
- 10.0 Testing to Validate Mission Critical Facility Requirements. Important characteristics such as electrical efficiency, realized capacity, operation with typical mission critical facility loads will be verified under controlled test conditions. Testing will also include simulation of typically expected product failure modes as defined by the PTP Panel or the single point of failure analysis, as well as expected maintenance functions and changes in operating configuration that can be reasonably expected to occur during five years of use. Functional and performance testing will take into account previous failures recorded in the *Institute's* Abnormal Incident database. The results from these simulated tests must demonstrate the product responds in the manner expected or promised by the manufacturer's specifications or literature.

Product Performance Evaluation Scoring and Levels of Product Certification

To achieve the Program goal of providing a means for recognizing manufacturer innovation and enhanced product features, characteristics, or performance that go beyond basic mission critical requirements and the associated standard functional type tests, a bonus point scoring method has been developed.

Three levels of product certification have been established. Gold and Silver certification require an accumulation of performance credits demonstrating advanced features, characteristics or performance benefits significantly beyond minimally acceptable requirements.



Gold Standard Meets the minimum acceptable level of performance for each evaluation category and demonstrates advanced features or benefits which exceed industry norms resulting in performance credits equal to or greater than 15.

Silver Standard Meets the minimum acceptable level of performance for each evaluation category and demonstrates advanced features or benefits which exceed industry norms resulting in performance credits equal to or greater than 10.

Acceptable Meets the minimum acceptable level of performance for each evaluation category.

Not Certified Does not meet all minimum acceptable level of performance or has serious drawbacks in one or more evaluation categories.