PCC-QAPD

Topical Report January 1988

# Quality Assurance Program Description

.

## **Power Computing Company**

Babcock & Wilcox a McDermott company 1930 Hi Line Drive Dallas, Texas 75207

8712290250 871222 PDR TOPRP EMVBW C PDR

5	n	n		n	A	13	-
1	10	£.,	-		14	$\mathbf{u}$	1
	5	1.1		14	11		~

Topical Report January 1988

Power Computing Company Dallas, Texas

Topical Report PCC-QAPD

Quality Assurance Program Description

#### ABSTRACT

The Topical Report PCC-QAPD describes the Quality Assurance Program of Power Computing Company (PCC) in compliance with Title 10, Code of Federal Regulations, Part 50, Appendix B.

In this program, PCC has translated the requirements established for nuclear facilities to similar activities performed by the information processing industry. This software quality assurance program is based on the applicable guidelines contained in Regulatory Guide 1.28, Revision 3, dated August, 1985; and the requirements of ANSI/ASME NQA-1-1983, Quality Assurance Program Requirements for Nuclear Facilities, and the ANSI/IEEE Standard 730-1984, IEEE Standard for Software Quality Assurance Plans.

The program is implemented for computing services activities provided to PCC's nuclear industry clients. These activities include the procurement or design of designated software and the configuration management activities involved in providing access to a special library of these certified programs.

m.	m.	m		0	A.	n	r
$\nu$			-		14	$\mathbf{r}$	ε
	~	$\sim$		~	1.1	1.1	ь

Topical Report January 1988

#### INTRODUCTION

The purpose of this report is to describe the Quality Assurance Program of Power Computing Company. This Quality Assurance Program applies to the computing services activities involved in providing a special library of certified programs, designated QALIB, and to the components of their respective operating systems that could adversely affect the results of these programs. This program also represents the master Software Quality Assurance Plan as it applies to designated PCC software developed after the effective date of the program at PCC.

The report is organized according to the eighteen criteria listed in Appendix B of 10CFR50.

As indicated in their corresponding sections of this report, the following basic requirements in NQA-1-1983 and their associated supplemental requirements are considered to be not applicable to PCC's Scope of Services:

- 8 Identification and Control of Items
- 9 Control of Processes
- 10 Inspection
- 12 Control of Measuring and Test Equipment
- 14 Inspection, Test and Operating Status

As shown in Appendix 1 of this report, Power Computing Company is a business unit in the Electronic Information Systems Division of Babcock & Wilcox (B&W) and serves as a supplier to other B&W divisions. Acquired by B&W in 1986, the organization was formerly the Computing Services Division of UCCEL Corporation and has been providing computing services, software and professional services to the nuclear industry for many years.

#### POLICY STATEMENT QUALITY ASSURANCE

Quality in workmanship is an integral component in the success formula for American business. We at Power Computing Company have always taken pride in the quality and performance of our products and services. Our future success is dependent upon our continued commitment to delivering quality products and services.

The Quality Assurance Program for PCC herein described was developed for compliance with the requirements of the nuclear power utilities and their suppliers. In development of this program, PCC has translated the requirements established for nuclear facilities to similar activities performed by the computing service industry. It is based on the applicable requirements of Title 10, Code of Federal Regulations, Part 50, Appendix B; ANSI/ASME NQA-1-1983, Quality Assurance Program Requirements for Nuclear Facilities; and ANSI/IEEE Standard 730-1984, IEEE Standard for Software Quality Assurance Plans. The program meets the guidelines contained in Regulatory Guide 1.28, Revision 3 (August, 1985).

The Vice President of Sales & Marketing has been assigned the responsibility of establishing and maintaining a list of Qualified Computer Programs (QCP) that will be certified as meeting the requirements of this QA program. When these programs are offered on a services basis, once they are certified, they will reside in QALIB, a special library or grouping of programs established on each service center. Only those QCPs and components of their respective computer operating systems are under the requirements of this QA program.

The Quality Assurance Manager has been delegated the authority and responsibility for the development and enforcement of the PCC QA program. This delegation also confers the authority to "stop work" and control further processing of items found to be in nonconformance with the QA program.

The Vice President of Computer Operations, the Vice President of Professional Services, and the Vice President of Sales & Marketing have been assigned the responsibility for development and execution of procedures that implement the QA program within their respective departments.

All PCC employees performing quality-related activities under the cognizance of the QA program are required to follow established policies and procedures in the performance of their work.

molus lotus

R. R. ANDREWS Vice President Power Computing Company Babcock & Wilcox a McDermott Company

POWER COMPUTING Babcock & Wilcox a McDermott company	Title TABLE OF CONTENTS	Document: <u>QAPD</u> Document Revision: <u>5</u> Effective: <u>01/01/88</u>
QUALITY ASSURANCE PROGRAM DESCRIPTION		Page of Page Revision:5

. . .

1 . . . .

SECTION	TITLE	REVISION	EFFECTIVE	
1 2 3 4 5	ORGANIZATION QUALITY ASSURANCE PROGRAM SOFTWARE DESIGN CONTROL PROCUREMENT DOCUMENT CONTROL INSTRUCTIONS, PROCEDURES, AND DRAWINGS	4 5 2 3	01/01/88 01/01/88 01/01/88 07/01/86 04/01/87 01/01/88	R5
6 7 8 9	CONTROL OF PURCHASED ITEMS AND SERVICES IDENTIFICATION AND CONTROL OF ITEMS CONTROL OF PROCESSES	3 0 0	01/01/88 02/01/85 02/01/85	R5
10 11 12	TEST CONTROL CONTROL OF MEASURING AND TEST FOULPMENT	4 0	02/01/85	R5
13 14 15 16 17 18	HANDLING, STORAGE AND SHIPPING INSPECTION, TEST, AND OPERATING STATUS CONTROL OF NONCONFORMING ITEMS CORRECTIVE ACTION QUALITY ASSURANCE RECORDS AUDITS	1 0 2 4 1 2	09/01/87 02/01/85 01/01/88 01/01/88 07/01/86 07/01/86	R5
APPENDIX				
1 2 3 4	ORGANIZATION CHARTS EXCEPTIONS AND ALTERNATIVES QA PROCEDURES CROSS REFERENCE DEFINITIONS AND ACRONYMS	5 3 1 4	C1/01/88 O1/01/88 O1/01/88 O1/01/88	R5



POWER COMPUTING Babcock & Wilcox a McDermott company	Title ORGANIZATION	Document: <u>QAPD-1</u> Document Revision: <u>4</u> Effective: <u>01/01/88</u>
QUALITY ASSURANCE PROGRAM DESCRIPTION		Page of Page Revision:3

#### 1.0 Organization

The organization charts contained in Appendix 1 identify the authority and reponsibility of all organizational elements of Power Computing and identify those that function under the cognizance of the QA program.

## 1.1 Power Computing Company

- 1.1.1 The Vice President reports to the Vice President and General Manager of the McDermott Electronics Information Systems Division of Babcock & Wilcox, a McDermott Company, and is responsible for management of Power Computing.
- 1.1.2 In his role as Vice President of Power Computing, he is the senior PCC official responsible for the establishment and implementation of a QA program that meets U. S. Nuclear Regulatory Commission requirements. He has delegated the authority and responsibility for the establishment and enforcement of the QA program to the Quality Assurance Manager. He has assigned the authority and responsibility for the establishment and implementation of procedures that meet QA program requirements to the Vice President of Computer Operations, the Vice President of Sales & Marketing, and the Vice President of Professional Services.



R3

Document:	QAPD-1	
Page Revisio	on: 3	}
Effective:	04/01/8	37
Page 2	of	5

#### 1.2 Quality Assurance

- 1.2.1 The Quality Assurance Manager reports to the Vice President, Power Computing, and has the authority and responsibility to establish and enforce a QA program that meets NRC requirements. The QA function and its reporting relationship to other organizations within PCC is shown on pages 2 & 3 of Appendix 1. It can be seen that the QA function:
  - Is at the same organization level as the highest line manager directly responsible for performing activities effecting quality.
  - Is independent from cost and schedule.
  - Has communication channels with other senior management.
  - Has no other duries or responsibilities unrelated to OA.
- 1.2.2 The Quality Assurance Manager and his/her staff verifies conformance to QA program requirements by:
  - Supervising internal audits of activities affecting quality.
  - Performing external audits of suppliers for compliance with the QA requirements of purchase orders, contracts, and license agreements.
  - Reviewing implementing procedures developed by other organizational elements for conformance with QA program requirements.
  - Reviewing purchase orders, contracts, and license agreements for inclusion of proper QA requirements.
  - Reviewing quality affecting design documents for conformance with QA program requirements.
- 1.2.3 Through these activities, the Quality Assurance Manager and/or his/her staff identifies quality problems; initiates, recommends, or provides solutions to these problems; and verifies implementation of the solution.

3992

R3

Document:	QAPD-1
Page Revisio	n: 4
Effective:	01/01/88
Page 3	of 5

- 1.2.4 Disputes between the QA staff and other organizational elements are referred to the Vice President, Power Computing.
- 1.2.5 The qualification requirements for the Quality Assurance Manager have been established in a PCC position description. The QA Manager must have a degree in engineering, math, computer science or business or a substitute level of experience determined acceptable by the next higher level of management. The minimum experience requirements are one (1) year in a management position and one (1) year in QA or QA-related functions.

## 1.3 Computer Operations Department

- 1.3.1 The Vice President, Computer Operations, reports to the Vice President, Power Computing, and is responsible for the activities of the following organizational elements:
  - CDC Operations
  - CDC System Software/Support

-

- IBM Service Center
- Communications/Hardware Services

Only those organizational elements denoted by an asterisk perform functions that are under the cognizance of the QA program.

1.3.2 The Vice President, Computer Operations, is responsible for the establishment and execution of procedures that implement the QA program on quality-related activities provided by those organizations identified in Section 1.3.1. These departments and the quality-related activities/services performed by each organizational element are depicted on page 5 of Appendix 1.

Document:	QAPD-1
Page Revisi	on: 3
Effective:	04/01/87
Page 4	of

#### 1.4 Sales & Marketing Department

1.4.1 The Vice President, Sales & Marketing Department, reports to the Vice President, Power Computing, and is responsible for the activities of the following organizational elements:

-	EPI Field Sales	*
-	EPRI Account	*
-	Major Account Sales	
-	Marketing	*
-	Integrated Programs	*

Only those organizational elements denoted by an asterisk perform functions that are under the cognizance of the QA Program.

1.4.2 The Vice President, Sales & Marketing Department, is responsible for the establishment and execution of procedures that implement the QA program on quality related activities/services. The Sales & Marketing Department and the quality-related activities/services performed by each organizational element is depicted on page 4 of Appendix 1.

#### 1.5 Professional Services Department

- 1.5.1 The Vice President, Professional Services, reports to the Vice President, Power Computing, and is responsible for the activities of the following organizational elements:
  - Vienna Professional Services
  - Systems Development
  - EPRI EPSC

(ŀ

ø

- Applications Development Special Projects Workstation Projects EPRI - ESCG
  - Technical Writer

R3

R3

Page Revision: <u>3</u> Effective: <u>04/01/87</u> Page 5 of 5	Document:	QAPD-1
Page 5 of 5	Page Revisi	on: 3
Page 5 of 5	Effective:	04/01/0/
1 dig 0	Page 5	of5

1.5.2 The Vice President, Professional Services, is responsible for the establishment and execution of procedures that implement the QA Program on quality-related activities provided by those organizations identified in Section 1.5.1. These organizational elements and the quality-related activities/services performed are shown on page 6 of Appendix 1.

Power Computing Babcock & Wilcox a McDermott company	Title OUALITY ASSURANCE PROGRAM	Document:QAPD-2 Document Revision:4 Effective:01/01/88
QUALITY ASSURANCE PROGRAM DESCRIPTION		Page of Page Revision:2

#### 2.0 Quality Assurance Program

- 2.1 The development, control, and use of Qualified Computer Programs and other related activities provided by Power Computing will be conducted in accordance with the Quality Assurance Procedures (QAPs) established to implement the requirements of the PCC QA program. Qualified Computer Programs are those computer programs that are designated by the Vice President of Sales & Marketing as marketable products requiring certification under the QA program. PCC will provide any special equipment, environmental conditions, skills, or processes necessary for satisfactory implementation of this program.
- 2.2 The QAP's necessary to implement the QA program will be developed and executed with the documented approval of the vice president of the responsible organization. The Quality Assurance Manager, and/or his staff will review these QAP's for consistency with QA program commitments and document their concurrence. QAP's are classified as controlled documents and, as such, are distributed under the document control system.
- 2.3 The PCC QA program has been developed to comply with the applicable requirements of Title 10, Code of Federal Regulations, Part 50, Appendix B; ANSI/ASME NQA-1-1983, Quality Assurance Program Requirements for Nuclear Facilities; and ANSI/IEEE Standard 730-1984, Standard for Software Quality Assurance Plans. Exceptions and/or alternatives to requirements contained in these documents are



R2

Document:	QAPD-2
Page Revisi	ion: 4
Effective:	01/01/88
D 2	of 2

presented in Appendix 2. The program also meets the guidelines contained in Regulatory Guide 1.28, Revision 3 (August, 1985). The hierarchy of the procedures and a representative list is shown in Appendix 3.

- 2.4 A Quality Council consisting of the responsible Department vice presidents and chaired by the Vice President, Power Computing, has been established to oversee the QA program. Once each quarter, the QA Manager submits a QA program status report containing the results of internal audits, audits of PCC by external organizations, external audits performed by PCC, nonconformances and any quality trends identified during the reporting period. The Quality Council assesses the scope, status, adequacy, implementation, and compliance with QA program commitments. Once each year, a member of the council, other than the QA Manager, documents an evaluation of the effectiveness of the QA Program. Items that require corrective action are documented and tracked under the corrective action program.
- 2.5 PCC personnel performing quality-effecting activities under the cognizance of the QA program are required to attend the QA indoctrination and training course. Attendees are instructed as to the objectives, scope, and implementation of the QA program, policies, and procedures and PCC maintains a record of each course presented. Provisions have been established for triennial retraining of personnel who perform quality-effecting activities. The technical qualification of personnel is evaluated by the individual's manager.

R4

Power Computing Babcock & Wilcox a McDermott company		SOFTWARE	Title	CONTROL	Document: <u>QAPD-3</u> Document Revision: <u>5</u> Effective: <u>01/01/88</u>
	QUALITY ASSURANCE PROGRAM DESCRIPTION				Page of Page Revision:5

#### 3.0 Software Design Control

#### 3.1 Scope

PCC functions as a service organization to the EPI and others providing computer resources; software (computer programs and documentation) designed (developed) by PCC and vendors or obtained from public domain libraries; and professional services. Applications Software on the QCP and designed by PCC are subject to all of the requirements of the PCC software design control program. Applications Software obtained from external sources and offered to the EPI are subject to the following PCC design controls:

- Interface control
- Validation
- Change control

Reworked, revised and replacement software undergo the same controls as the original.

## 3.2 Internally Designed Applications Software

3.2.1 PCC Designed Software

3.2.1.1 Design Process

and control Applications Software design from the initial input to the final release to

Measures have been established to document

Page:	1	2	3	4	5	6	7	8	9									
Page Revision:	5	4	5	5	5	5	5	5	3			6						
Authorized:	C	Th	aits	the	5	Au	the	die	_	10	du	t	e	Ci	ali	ier	-	

R5

R5

Document:	QAPD-3
Page Revision	. 4
Effective:	09/01/87
Page 2	of9

production. These measures require that the product of each phase of the design process be independently verified to assure that it fulfills the requirements established by the previous phase, reviewed by the QA staff for inclusion of quality requirements, and reviewed and authorized for release as a controlled document by responsible management. These measures also require that applicable quality standards be specified in the design document and that all deviations from these standards be documented and approved by responsible management, with concurrence of the QA staff. Design process documentation is prepared in sufficient detail to permit independent verification.

The PCC design process depicted in Figure 3.1 is a major part of the overall PCC software development process. For presentation clarity, the design process depicted in Figure 3.1 does not attempt to convey the possible ways the development process can be phased (e.g., the "Develop User Manual" activity may be started during the "Design" phase and may be completed during the "Testing" phase). The PCC software development process also includes a software maintenance phase. This phase is not depicted in Figure 3.1, but is addressed in Section 3.2.1.6, Change Control.

#### 3.2.1.2 Design Input

The requirements (functions, performances, constraints, attributes, applicable regulatory requirements and standards) of the software and its external interfaces are specified in a Software Requirements Specification (SRS). Each requirement is described in sufficient detail that independent verification and implementation can be achieved. The SRS functions as the primary input to the software design process.

Document:	QAPD-3
Page Revision	5
Effective:	01/01/88
Page 3	of 9

#### 3.2.1.3 Design Interfaces

Measures have been established to document and control the flow of design information between participating organizations, both internal and external. These measures require that these organizations be identified, documented on the affected design document, and be included in the review, approval, release, distribution, and change control process. Oral transmittals are documented by a letter/memo of confirmation.

#### 3.2.1.4 Design Verification and Validation

The PCC QA program utilizes the following definitions of verification and validation:

Verification - The process of determining by reviews, and/or alternate calculations and testing (when possible) whether or not the product of a phase of the software design process fulfills the requirements established during the previous phases.

Validation - The process of determining whether executing the system (i.e., software, hardware, user procedures, and personnel) in a user environment (either simulated or real) causes any operational difficulties. The process includes ensuring that sufficient operational testing is performed before the software is placed in production status for users. See Appendix 4 for variations.

Verification and validation activities are accomplished by qualified individuals who were not involved in the original activity but may be from the same organizational element. The use of the immediate supervisor of the originator as the verifier/validator is justified, documented and approved in advance by higher management and is restricted to those cases where he is the only individual technically qualified to

Document	. QAP	D-3
Page Revi	sion:	5
Effective:	01/0	1/88
Page	of	9

perform this activity. To avoid abuse, the frequency and effectiveness of these practices are checked in QA audits.

A Software Verification and Validation Plan (SVVP), approved by responsible management, will describe the method of verification for each phase of software design activity (e.g., review and/or alternate calculations, and testing, when possible) to be used and the responsibilities of individuals performing the activity. The plan will also specify the validation test problems, and their known solutions, to be executed to ensure that the program functions meet requirements specified in the SRS and do not cause any operational difficulties.

The results of the software design control process are documented in the Software Verification and Validation Report (SVVR) which describes the results of all required reviews, audits, and tests. The SVVR is reviewed, approved, and issued as a controlled document by responsible management, with the review and concurrence of the QA staff, prior to release of the software to production status or to another organization for use.

#### 3.2.1.5 Design Review

A Design Review Board (DRB) is established as a management oversight board consisting of qualified individuals not involved in the design to review the design of selected projects at milestone points within the process. The results of design reviews are documented. Items identified for corrective action are tracked by the DRB until resolution. At a minimum, the following reviews will be conducted:

Document:	QAPD-3
Page Revisi	on: 5
Effective:	01/01/88
Page 5	of9

- Software Requirements Review (SRR)
- Preliminary Design Review (PDR)
- Critical Design Review (CDR)
- Test Plan Review (TPR)

#### 3.2.1.6 Change Control

Measures have been established that require changes to software that has been released to production status be justified and subject to the same design control as the original, including review and approval of the original design organization. When a significant change is necessary because of an incorrect design, the design process and verification procedure shall be reviewed and revised as necessary.

## 3.3 Externally Designed Applications Software

#### 3.3.1 Vendor Supplied Software

#### 3.3.1.1 Interfaces

Measures have been established to document and control the flow of information (e.g., operational problems, recommended changes, etc.) between PCC clients (users), PCC personnel, and the software vendor. Oral transmittals are documented by a letter of confirmation.

#### 3.3.1.2 Verification

Software vendors are responsible for verification of their software. They determine the accuracy of the software by execution and comparison of results with a representative set of verification test problems and their solution. A validation test set and the corresponding results sufficient for operational testing are

Document:	QAPD-3
Page Revisi	on: 5
Effect ve:	01/01/88
Page 6	of 9

provided to PCC. Vendor verification activities and records are audited by the PCC QA staff.

#### 3.3.1.3 Validation

Vendor supplied software is retested by PCC using the validation test set. A comparison is made between results supplied by the vendor and those obtained by PCC. Test results are independently reviewed by appropriate individuals. Any discrepancies identified during the review are submitted to the vendor for resolution.

#### 3.3.1.4 Change Control

The responsibility for authorizing/implementing changes in vendor supplied software is retained by the vendor. PCC identifies any documents needed or desired changes to software and transmits the information to the vendor. The vendor either implements the change or authorizes PCC to make the change.

#### 3.3.2 Public Domain Software

#### 3.3.2.1 Verification

Software obtained from public domain libraries is installed and placed into production status by PCC without verification.

#### 3.3.2.2 Validation

Public domain software is subjected to validation testing by PCC prior to being placed in production status. The extent of validation testing is dependent on the availablity of test problems and their solution. If none are available, PCC uses samples (with solutions) in the user manual, develops tests and/or obtains them from the client base for use in validation.

Document:	QAPD-3
Page Revision	n: 5
Effective:	1/01/88
Page 7	of

#### 3.3.2.3 Change Control

Public domain software placed into production status is subject to the same change control measures established for vendor supplied software.

#### 3.3.3 PCC-MOD Software

This is a category of public domain software in which modifications were made to public domain software by PCC or under contract with companies specializing in the particular technology involved (e.g., performance enhancements, error corrections or added features). This category does not apply to public domain programs which undergo changes in order to make the program operational on a designated computer system.

#### 3.3.3.1 Verification

Verification of the modifications will be to a level that does not degrade verification available in the public domain. PCC will provide available verification information to its clients, along with available documentation on the changes made, if requested.

#### 3.3.3.2 Validation

The extent of validation is dependent on the availability of test problems and their solutions. Tests from the public domain distribution, along with any nonproprietary tests acquired from other sources (e.g., PCC contractors) will be used in validation of the software on PCC systems. Test results are independently reviewed by appropriate individuals. Discrepancies identified during testing are resolved by PCC.

Document:	QAPD-3
Page Revisio	on: 5
Effective:	01/01/88
Page 8	of 9

#### 3.3.3.3 Change Control

Change control will be the responsibility of PCC. This includes source maintenance, version designation and documentation of changes.

## 3.4 Operating System Software

0

3.4.1 Operating system software, communications software and compilers are provided by the equipment manufacturer. Local modifications are made as necessary to support specific customer needs. Modifications, changes, or new software adding to, or replacing, any of the software of these types are first tested on the system and given a PCC unique name and version before being installed in the production system. Tests required for assuring the quality of the modified or new system are a function of the degree of deviation from the system being replaced and shall be defined prior to the time of testing. Those portions of the operating system software that could affect critical applications software are identified at the procedural level and changes to this software are controlled under the QA Program.

Document:	QAPD-3
Page Revisio	on:3
Effective:	04/01/87
Page 9	0, 9

\*.

۲

.

R3

#### PCC SOFTWARE DESIGN PROCESS

2

3



5

POWER COMPUTING	Title	Document: <u>QAPD-4</u> Document Revision: <u>2</u>
a McDermott company	PROCUREMENT	Effective: 07/01/86
QUALITY ASSURANCE PROGRAM DESCRIPTION	DOCUMENT CONTROL	Page Revision: _2

#### 4.0 Procurement Document Control

- 4.1 Measures have been established that require the review of procurement documents by the QA staff to assure that:
  - Quality requirements are correctly stated.
  - Adequate acceptance/rejection criteria are included where required.
  - Documents have been prepared, reviewed, and approved in accordance with program requirements.
  - Documents require the vendor to have an acceptable QA program.
- 4.2 These measures require that each procurement package include documents that specify applicable regulatory, technical, administrative, and reporting requirements; specifications; codes and standards; and testing requirements. These measures also require that documents specify that the vendor's QA program must have QA staff review and concurrence prior to placement on the PCC Approved Vendor List (AVL).
- 4.3 Procurement documents are prepared, independently reviewed, and approved by management of the initiating organizational element. Potential vendors are selected for placement on the AVL. The contract award is based on an evaluation by the originating organization and the QA staff. Changes in procurement documents are subject to the same degree of control as was utilized in the preparation of the original document.

Page:	1	2																	
Page Revision:	2	1																	
Authorized:	C	2h	aito	t	1	A	tet	thu	i	K	d	aci	1 1	- (	11	di	un	-	

R2

Document	QAPD-4
Page Revis	sion:
Effective: _	09/01/85
Dana 2	of 2

4.4 Procurement documents for software in which PCC will have an ownership interest will include acceptance/rejection criteria. For software licensed from a vendor for distribution by PCC, a baseline evaluation will be performed before acceptance, and the acceptance/rejection guidelines will be included at the procedural level.

Power Computing	Title	Document: <u>QAPD-5</u>
Babcock & Wilcox	INSTRUCTIONS, PROCEDURES	Document Revision: <u>3</u>
a McDermott company	AND DRAWINGS	Effective: <u>04/01/87</u>
QUALITY ASSURANCE PROGRAM DESCRIPTION		Page of Page Revision:3

## 5.0 Instructions, Procedures, and Drawings

- 5.1 Quality Assurance Procedures (QAPs) necessary to implement the requirements of the PCC QA Program are developed and implemented by the organization responsible for the quality-affecting activity. These QAPs specify quantitative and/or qualitative acceptance criteria needed to determine that the activity has been satisfactorily accomplished.
- 5.2 Supplemental QAPs (SQAPs) may be developed and implemented on specific projects in response to unique client requirements. These SQAPs may expand and/or add to existing requirements but cannot decrease them.
- 5.3 QAPs and SQAPs must receive the review and concurrence of the QA staff prior to issuance.



Power Computing Babcock & Wilcox a McDermott company	Title DOCUMENT CONTROL	Document:QAPD-6 Document Revision:4 Effective:01/01/88	10
QUALITY ASSURANCE PROGRAM DESCRIPTION		Page of Page Revision:4	R

## 6.0 Document Control

6.1 Measures have been established for the review, approval, issuance, and distribution of quality-affecting documents to affected individuals/organizations listed on the PCC Master Distribution List (MDL). Documents such as design documents, installation and test procedures, QA procedures, and the QAPD are classified as "controlled" documents for distribution purposes, have numbered copies, and the recipients are required to return the obsolete document or superceded pages along with a signed receipt for their replacement. Follow-up measures are provided for those receipts overdue by thirty (30) days.

Other documents such as procurement documents, error (nonconformance) reports and other quality-affecting notices are under a receipt control system which requires either acknowledgement receipt and follow-up or no acknowledgement receipt, depending on the classification of the document.

- 6.2 Revisions to quality-affecting documents are reviewed and approved in the same manner as the originals.
- 6.3 These measures also require that with the issuance of a PCC quality-affecting document, its identifier, title, revision/ version number, and effective date be entered into the PCC Current Document List (CDL) maintained by the Document Control Center. PCC personnel have been instructed to verify that they have the appropriate revision of a document prior to its use.



Document:	UAPD-0	
Page Revision	1: 4	
Effective:	01/01/88	
Page 2	012	_ R4

6.4 Client notices of change regarding Applications Software in QALIB include identification of the revision of the user manual(s) applicable to the software version.

.

6.5 These measures are also applied to the magnetic media involved in the distribution of Applications Software releases to licensees.

R4

Power Computing Babcock & Wilcox a McDermott company	Title CONTROL OF PURCHASE	Document: <u>QAPD-7</u> Document Revision: <u>3</u> Effective: <u>01/01/88</u>	
QUALITY ASSURANCE PROGRAM DESCRIPTION	ITEMS AND SERVICES	Page <u>1</u> of <u>2</u> Page Revision: <u>3</u>	R.

## 7.0 Control of Purchased Items and Services

- 7.1 Measures have been established to control the procurement of computer programs and related services. These measures require that the initiating organization identify and document other affected PCC organizations, and obtain their review and concurrence and that of the QA staff prior to release of the procurement package.
- 7.2 An evaluation of a vendor's history of providing an identical or similar computer program to PCC which has performed satisfactorily is conducted by PCC prior to their placement on the PCC AVL. When a vendor's history cannot be evaluated, PCC will review their QA program for acceptability prior to placement on the AVL. Following contract award, and prior to a computer program's certification to production status, PCC will audit the vendor to verify implementation of its QA program with emphasis on computer program verification activities.
- 7.3 Criteria for acceptance of deliverables are specified at a procedural level. Product acceptance testing is accomplished upon receipt of the computer program by subjecting it to tests utilizing validation test problems supplied by the vendor.
- 7.4 Vendor supplied computer programs classified as "Commercial Grade", i.e., available as "off-the-shelf" items for use in non-nuclear and nuclear applications as described in the vendor's catalog or sales brochure, are



IR3

Document: QAPD-7	
Page Revision:3	
Effective: 01/01/88	1
Page of	R3

subject to product acceptance testing by PCC. On a case by case basis, PCC will determine what validation tests are necessary in order to dedicate these programs for use in a safety-related application. Vendor QA program requirements applicable to post-award activities are identified in the procurement package.

8

R3

(

POWER COMPUTING Babcock & Wilcox a McDarmott company	Title IDENTIFICATION AND	Document:QAPD-8 Document Revision:0 Effective:02/01/85
QUALITY ASSURANCE PROGRAM DESCRIPTION	CONTROL OF ITEMS	Page of Page Revision:0

Page:	1	
Page Revision:	0	
Authorized:	Chartette Aathie	Kolut K Aralus

Power Computing Babcock & Wilcox s McDermott company	Title CONTROL OF PROCESSES	Document:QAPD-9 Document Revision: Effective:02/01/85
QUALITY ASSURANCE PROGRAM DESCRIPTION		Page of Page Revision:0

Page:	1
Page Revision:	0
Authorized:	Chartatto Authice Kout & Cendler

Power Computing Babcock & Wilcox a McDermott company	Title	Document: <u>QAPD-10</u> Document Revision: <u>0</u> Effective: <u>02/01/85</u>
QUALITY ASSURANCE PROGRAM DESCRIPTION		Page of Page Revision:0

Page:	1	Π		Π		1									
Page Revision:	0								0						
Authorized:	C	harts	the	X	athi	ie	A	for	int,	K	a	ind	lias	2	

POWER COMPUTING Babcock & Wilcox a McDermott company	Title TEST CONTROL	Document: <u>QAPD-11</u> Document Revision: <u>4</u> Effective: <u>01/01/88</u>
QUALITY ASSURANCE PROGRAM DESCRIPTION		Page of Page Revision:4

## 11.0 Test Control

Ô

#### 11.1 Procedures

Test procedures provide for requirements and acceptance limits, prerequisites and methods to assure they have been met, acceptance and rejection criteria, and the method of documenting the data and results.

### 11.2 Internally Designed Applications Software

## 11.2.1 PCC Software

11.2.1.1 Computer programs in the Qualified Computer Programs (QCP) designed (developed) by PCC are subjected to verification and/or validation testing in accordance with a test plan developed for that program prior to placement into production status.

## 11.3 Externally Designed Applications Software

Refer to Subsections 3.3.1.3 and 3.3.2.2 of Section 3.0.

11.4 Operating System Software

Refer to Subsection 3.4 of Section 3.0.



R4

Power Computing Babcock & Wilcox a McDermott company	Title CONTROL OF MEASURING	Document: <u>QAPD-12</u> Document Revision: <u>0</u> Effective: <u>02/01/85</u>
QUALITY ASSURANCE PROGRAM DESCRIPTION	AND TEST EQUIPMENT	Page of Page Revision:0

1

Page:	1																
Page Revision:	0										6		-	L			
Authorized:	C	24	ait	totte	\$ X	fred	the	e	1	de	11	R	In	di	ur	-	

Power Computing Babcock & Wilcox a McDermoti company	Title HANDLING, STORAGE,	Document: <u>QAPD-13</u> Document Revision: <u>1</u> Effective: <u>09/01/87</u> Page <u>1</u> of <u>1</u>					
QUALITY ASSURANCE PROGRAM DESCRIPTION	AND SHIPPING	Page of Page Revision:					

#### 13.0 Handling, Storage, and Shipping

- 13.1 Instructions and/or procedures have been established to control the handling, storage, and shipment of physical media (magnetic disks, magnetic tapes, etc.) that assure they are not accidentally or maliciously used, modified, deteriorated, or destroyed. These measures include:
  - 13.1.1 Computer access control via authorized account numbers and passwords,
  - 13.1.2 Control of changes to operating systems and critical software,
  - 13.1.3 Backup of critical software and data files and storage of these media in two locations (PCC facility and off-site storage facility),
  - 13.1.4 Control of media shipments in accordance with industry accepted practices.
- 13.2 Limited access areas have been established to assure that only authorized personnel have access to computer areas and storage vaults. The computers and tape storage areas at PCC are protected by the Halon fire extinguishing system.



Power Computing Babcock & Wilcox a McDermott company	Title INSPECTION, TEST AND	Document: <u>QAPD-14</u> Document Revision: <u>0</u> Effective: <u>02/01/85</u>
QUALITY ASSURANCE PROGRAM DESCRIPTION	OPERATING STATUS	Page of Page Revision:0

......

\*

Not Applicable to PCC Scope of Services.

1



the service

Power Computing Babcock & Wilcox a McDermott company	Title CONTROL OF NONCONFORMING ITEMS	Document:QAPD-15 Document Revision:2 Effective:01/01/88
QUALITY ASSURANCE PROGRAM DESCRIPTION		Page of Page Revision:2

## 15.0 Control of Nonconforming Items

15.1 Measures have been established that require that any PCC or client identified nonconformance, including those contained within a computer program placed in production status, be documented in a Nonconformance Report (NCR) which specifies the nonconforming item, nature of the nonconformance, and recommended disposition.

A technical justification for a "no corrective action required" disposition must be documented on the NCR or attached thereto. The recommended disposition of nonconformances involving software will also specify immediate actions such as "use-as-is" or "remove from production".

- 15.2 The NCR provides for the review and approval by responsible management of the recommended disposition.
- 15.3 The QA staff reviews each NCR for compliance with applicable QAP's and concurrence with the recommended disposition. The QA staff signs the NCR to document their review.
- 15.4 If corrective action is required, data from NCR's is transcribed on to a Corrective Action Required (CAR) or Software Corrective Action Required (SCAR) form and placed in the PCC corrective action system for tracking and disposition.



R2

Document:	QAPD-15
Page Revisi	on: 07/01/86
Page _2	of2

- 15.5 Measures also require that PCC clients authorized to use the program be promptly notified of the nature of the nonconformance and its potential effect on program outputs that have been or will be obtained.
- 15.6 The software vendor is responsible for the identification and disposition of all nonconformances noted in vendor supplied software, and for reporting them to PCC for distribution under the provisions of subsection 15.5.

R1

Power Computing Babcock & Wilcox a McDermott company	Title CORRECTIVE ACTION	Document: <u>QAPD-16</u> Document Revision: <u>4</u> Effective: <u>01/01/88</u>
QUALITY ASSURANCE PROGRAM DESCRIPTION		Page of Page Revision:4

#### 16.0 Corrective Action

- 16.1 Measures have been established to assure that conditions adverse to quality (i.e., deficiencies, deviations and nonconformances) are promptly identified and corrected, and that measures to prevent their recurrence have been implemented. These measures require that the identified condition, proposed corrective action, preventive measures, and estimated completion dates be documented on a Corrective Action Required (CAR) or Software Corrective Action Required (SCAR) form.
- 16.2 In those cases where the corrective action involves changes to a computer program, the verification requirements must be specified on the SCAR or an attachment thereto.
- 16.3 The QA staff reviews the CAR/SCAR for correctness and adequacy of the corrective action and preventive measures, signs the form denoting concurrence, and enters the information into the PCC Corrective Action Tracking System (CATS). Timely accomplishment of appropriate corrective action is ensured through measures which elevate unresolved items to upper management.
- 16.4 Implementation of the corrective action and preventive measures is the responsibility of the vendor for vendor supplied programs or the responsible PCC organization for PCC designed programs. Responsible management signs the SCAR denoting approval of the corrective action. Independent verification is conducted on the implementation of corrective actions and preventive measures. This is documented by signature on the SCAR.

Page:	1	2	Τ	T													
Page Revision:	4	4									6		6	6			
Authorized:	C	hã	lot	t	X	ati	hil	~	k	de	th	R	-	nde	eve	-	

Documen	t: QAPD-16
Page Rev	ision: 4
Effective:	01/01/88
Page	2 of 2

- 16.5 Follow-up action is taken by the QA staff to verify proper implementation of the corrective action and preventive measures and to close out the CAR.
- 16.6 Once each calendar quarter, the QA staff analyzes CATS data to determine quality trends. Significant conditions adverse to quality, their cause, and the corrective actions taken to prevent recurrence are identified. The results of this analysis are reported to upper management for review and assessment.

POWER COMPUTING	Title	Document:QAPD-17
Babcock & Wilcox a McDermott company	QUALITY ASSURANCE RECORDS	Effective: 07/01/86
QUALITY ASSURANCE PROGRAM DESCRIPTION		Page of Page Revision: _2

## 17.0 Quality Assurance Records

17.1 Measures have been established by the QA staff for the collection and storage of records that furnish documentary evidence of the activities affecting quality. These measures include receipt control and validation of records prior to entry in the records system.

These measures also specify record retention periods, record quality, and access controls.

17.2 These records are indexed, filed, and maintained in facilities that provide suitably controlled conditions to minimize deterioration or damage and to prevent loss. A duplicate set of records is maintained in a separate and remote location.

Page:	1				Τ	Τ											
Page Revision:	2																
Authorized:	C	hait	totte	5	Au	thu	ė	-	R	ou	at	K	2	cie	lu	 -	

POWER COMPUTING Babcock & Wilcox & McDermoti company	Title AUDITS	Document: <u>QAPD-18</u> Document Revision: <u>2</u> Effective: <u>07/01/86</u>		
QUALITY ASSURANCE PROGRAM DESCRIPTION		Page of Page Revision:1		

#### 18.0 Audits

- 18.1 Measures have been established that provide for a series of audits by the QA staff to independently verify and evaluate implementation of the QA program. An audit plan is established that identifies the audits to be performed, their frequency, and schedule for completion. This plan assures that all areas where the requirements of the QA program apply are audited at least once each year, or once during the life of the activity.
- 18.2 These audits are performed in accordance with written procedures and/or checklists by appropriately trained personnel independent of the audited activity. During the audit, applicable QAP's are evaluated, records examined, and discussions held with audited personnel to assure that the QA program is effective and is being properly implemented.
- 18.3 Audit results are documented by auditing personnel and include a listing of the records examined, personnel contacted, and those personnel in attendance at the audit meetings. Audit reports are distributed to management of the audited activity to take the necessary action to correct any deficiencies identified during the audit. A follow-up audit of deficient activities to verify proper implementation of committed corrective actions and preventive measures is conducted.

Page:	1	2																
Page Revision:	1	2																
Authorized:	0	Th	al	etti	t,	A	A	lue		/	ba	T	K	2	ind	la	~	

Document	OAPD-18	
Page Revis	sion: 2	_
Effective:	07/01/86	_
Page 2	of 2	

18.4 A series of special audits are conducted during the development of PCC designed computer programs to provide additional assurance of product quality. A functional audit is conducted prior to program delivery to verify implementation of the SRS. A physical audit is conducted to verify that the program and its documentation are internally consistent and ready for delivery. In-process audits are conducted during each phase of the design process to verify consistency of the design.



A :



.

R4

1

Document	QAPD-APP 1
Page Revisi	on: 4
Effective:	09/01/87
Page 2	of 6



Document:	QAPD-APP	1
Page Revision	. 4	
Effective: 0	9/01/87	
Page 3	of 6	



b

B

R4

ŝ

「 こののでの、

Document:	QAPD-APP 1
Page Revisi	on: 5
Effective:	01/01/88
Page 4	of 6



0

Ģ

\* The wide line denotes those organizations under the QA Program.



8

\* The wide line denotes those organizations under the QA Program.

e



Projects performed under contract with the Electric Power Research Institute (EPRI): EPSC = Electric Power Software Center

ESCS . EPRI Software Consulting Group

Power Computing Babcock & Wilcox a McDermott company	Title EXCEPTIONS AND ALTERNATIVES	Document: <u>QAPD-APP 2</u> Document Revision: <u>3</u> Effective: <u>01/01/88</u>
QUALITY ASSURANCE PROGRAM DESCRIPTION		Page of Page Revision:3

The PCC quality assurance program presented in this QAPD has been developed to meet the guidelines contained in Regulatory Guide 1.28, Revision 3, (August, 1985), and requirements specified in 10 CFR50, Appendix B; ANSI/ASME NQA-1-1983, Quality Assurance Program Requirements for Nuclear Facilities; and ANSI/IEEE Std 730-1984, IEEE Standard for Quality Assurance Plans. In development of this program, PCC has translated the requirements established for nuclear facilities to similar activities performed by the computing service industry. PCC commits to implementing the applicable requirements of the documents shown above with the following exceptions and alternatives:

#### 1.0 NQA-1-1983

The following basic requirements and their corresponding supplemental requirements are considered to be not applicable to PCC's scope of services:

- 8 Identification and Control of Items
- 9 Control of Processes
- 10 Inspection
- 12 Control of Measuring and Test Equipment
- 14 Inspection, Test, and Operating Status

#### 2.0 IEEE Std 730-1984

The PCC quality assurance program presented in this QAPD represents its "Software Quality Assurance Plan" applied to PCC software developed after the effective date of the QAPD. The specific requirements contained in this standard have been merged into the corresponding subject requirements of NOA-1.



Power Computing Babcock & Wilcox a McDermott company	Title QA PROCEDURES CROSS REFERENCE	Document: QAPD-APP 3 Document Revision: 1 Effective: 01/01/88	
QUALITY ASSURANCE PROGRAM DESCRIPTION		Page <u>1</u> of <u>3</u> Page Revision: <u>1</u>	R:

PROCEDURAL HIERARCHY TREE



|R1

Document:	QAPD-APP 3
Page Revis	ion: 1
Effective:	01/01/88
Page 2	of 3

-

| R1

## QA PROCEDURES CROSS REFERENCE

		QAPD Section	QAP	Subject	
1 .	-	Organization		See Criteria 5	
2 .	-	QA Program	QAP-102 QAP-101 QAP-110	QAPD Manual Indoctrination and Training Quality Council	
3 .	-	Software Design Control	QAP-202 QAP-300 QAP-301 QAP-302 QAP-303 QAP-304 QAP-305 QAP-307 QAP-310	Control of Operating System Software Software Design Control Design Review Board Design Interface Control Change Control Preparation of Design Documents Control of Applications Software Products Verification and Validation Change Control Board	
4 .	-	Procurement Document Control	QAP-107 QAP-306	QA Review of Contracts Procurement Document Control	R1
5 .	-	Instructions, Procedures and Drawings	QAP-100 QAP-109 QAP-401	QA Procedures Supplemental QA Procedures Client Specific Procedures	
6 .	-	Document Control	QAP-112 QAP-108	Document Control Document Review and Approval	
7 .	-	Control of Purchased Items	QAP-106 QAP-311	Supplier Qualification Requirements for Applications Software	
8 -	-	Identification and Control of Items		Not Applicable	
9 .	-	Control of Processes		Not Applicable	
10 .	-	Inspection		Not Applicable	
11 -	-	Test Control	QAP-305 QAP-307	Control of Applications Software Products Software Verification and Validation	

Document:	QAPD-APP 3
Page Revisi	on:1
Effective:	01/01/88
Page 3	of

R1

R1

## QA PROCEDURES CROSS REFERENCE (CONTINUED)

QAPD Section	QAP	Subject
12 - Control of Measuring and Test Equipment		Not Applicable
13 - Handling, Storage and Shipping		No specific procedures (QAPs) applicable to this criteria.
14 - Inspection, Test and Operating Status		Not Applicable
15 - Control of Nonconforming Items	QAP-308 QAP-111 QAP-201	Nonconforming Items Notification of Defects under 10CFR21 Hotline Operations
16 - Corrective Action	QAP-309	Corrective Action
17 - QA Records	QAP-104	Quality Assurance Records
18 - Audits	QAP-103 QAP-105	Qualification of QA Auditors Audits

Note: Cross referenced to 10CFR50 Appendix B criteria, this list of PCC's primary implementing procedures is included as representative of structure and content. Additions, modifications and/or deletions may be made without changing the intent of the QA Program or this list.

Power Computing Babcock & Wilcox a McDermott company	Title DEFINITIONS AND ACRONYMS	Document: <u>QAPD-APP 4</u> Document Revision: <u>4</u> Effective: 01/01/88			
QUALITY ASSURANCE PROGRAM DESCRIPTION		Page <u>1</u> of <u>3</u> Page Revision: <u>4</u>			

PCC accepts the definitions presented in the standards listed below except for the definitions of verification and validation:

- 1. ANSI/ASME NQA-1-1983, Quality Assurance Program Require-
- 2. ANSI/IEEE Std 730-1984, IEEE Standard for Software Quality Assurance Plans.

PCC's definitions are more specific than those in the standards. PCC enhanced the definition of verification to require testing at all times possible. Validation includes operational testing in a user environment.

The terms verification and validation as used by PCC have the following meaning:

- Verification The process of determining by review and/or alternate calculations and testing (when possible) whether or not the product of a phase of the software design process fulfills the requirement established during the previous phases.
- Validation The process of determining whether executing the system (i.e., software, hardware, user procedures, and personnel) in a user environment (either simulated or real) causes any operational difficulties. The process includes insuring that sufficient operational testing is performed before software is placed in production status for users as follows:

Page:	1	2	3															
Page Revision:	4	1	4									0		-				
Authorized:	C	26	hait	tt	1	A	A	huie		k	flu	th	2	In	idle	ws	-	

Document:	QAPD-APP 4
Page Revisio	on: 1
Effective:	09/01/85
Page	of

- For PCC-designed software, this includes insuring that specific program functions meet their requirements and specifications.
- For vendor-supplied software, a comparison is made between results supplied by the vendor and those obtained by PCC in retesting, using the supplied validation test problems.
- For public domain software, the extent of validation testing is dependent on the availability of test problems and their solution.

Document:	QAPD-APP 4
Page Revisio	on: 4
Effective:	01/01/88
Page 3	of 3

## ACRONYMS

ľ

ASME AVL B&W CAR CATS	American Society of Mechanical Engineers Approved Vendor List Babcock & Wilcox Corrective Action Required Corrective Action Tracking System
CDI	Curcent Document List
CDD	Critical Design Review
DDR	Decign Deview Roard
EDI	Electric Power Industry
IFFF	Institute of Electrical and Electronic Engineers
MDI	Master Distribution List
NCR	Nonconformance Report
NRC	Nuclear Regulatory Commission
PCC	Power Computing Company
PDR	Preliminary Design Review
QA	Quality Assurance
QALIB	Quality Assurance Library
QAP	Quality Assurance Procedure
QAPD	Quality Assurance Program Description
QCP	Qualified Computer Programs
SCAR	Software Corrective Action Required
SDD	Software Design Description
SQAP	Supplemental Quality Assurance Procedure
SRR	Software Requirements Review
SRS	Software Requirements Specification
SVVP	Software Verification & Validation Plan
SVVR	Software Verification & Validation Report
TPR	lest Plan Review

R4