

INTRODUCTION OF THE COMMERCIAL GRADE DEDICATION INTO NUCLEAR POWER PLANT KRŠKO (NEK) PROCUREMENT PROCESS

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Abstract

NEK management has undertaken a set of actions to improve the ability to provide equipment, spare parts and material needed to support operation and maintenance of the Krško plant. These actions are necessary due primarily to the fact that NEK is more and more confronted (increasing trend) with the issue that suppliers of safety-related equipment and spare parts have decided not to pursue the nuclear portion of their business, incl. specific QA systems and qualifications.. The purchase orders imposing these requirements are no longer accepted. In order to continue to obtain the necessary materials at the required quality level, a "Commercial Grade Item" (CGI) procurement and dedication program has been developed based on similar practices in the USA.

Introduction

CGI procurement is a process whereby parts are bought without imposing Appendix B Quality Assurance requirements on the supplier, and then dedicated for use in safety-related applications. The dedication process involves 1) based upon the required safety function, an engineering evaluation to identify critical characteristics of the item and specification of acceptance criteria; and 2) quality control activities to ensure the item(s) supplied meets the acceptance criteria specified.

The key to implementation of an effective program at NEK is to take advantage of the lessons learned in the USA, and implement those practices which were most effective, while avoiding those which were of limited value. There are two elements to developing such a program: 1) use of appropriate criteria for safety classification of parts within safety-related components; and 2) use of a dedication process: which optimizes CGI dedication efforts by selecting the minimum set of critical characteristics necessary to reasonably assure that the item received is the item ordered. Each of these elements, and the options available to NEK, are discussed in the article.

Background

In 1988, Electrical Power Research Institute, USA (EPRI) published "Guidance for the Utilization of Commercial Grade Items in Nuclear Safety-Related Applications, NCIG-07" (NP-5652) in response to a growing industry concern over an effective methodology to ensure the proper dedication of CGIs to be used in safety-related applications. This guidance received industry-wide acceptance.

Since the issuance of NP-5652, several industry and Nuclear Regulatory Commission (NRC) activities have occurred which have indicated the need for further clarification and guidance regarding the implementation of the process for dedicating commercial grade items for safety-related applications. In 1994, "Supplemental Guidance for the Application of EPRI Report NP-5652 on the Utilization of Commercial Grade Items" (TR-102269) was developed by EPRI's Plant Support Engineering (PSE) at the request of its member utilities.

Being a member on EPRI's-Plant Support Engineering module, NEK was able to understand and implement the guidance and the supplemental guidance and to develop its own "Program for the Procurement and Dedication of Commercial Grade Items" (ED-10) in 1995., under strict directives of NEK internal policies and objectives as presented in MD-1 ("NEK policies and objectives"), and other applicable programs e.g. Procurement Program (PD-1), Design Modifications Control Program (ED-1), Quality Assurance Program (QD-1), Quality Control Program (QD-2), etc.

Policy

NEK's policy for utilizing commercial grade items in safety-related applications fully complies with USA Code of Federal Regulations 10CFR50, Appendix B "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants" requirements, and current industry guidance as provided by the EPRI. Commercial grade items shall be procured in lieu of a basic component under one of the following circumstances:

- The supplier of the item cannot furnish the item under a nuclear quality assurance program meeting the full intent of 10CFR50, App. B.
- The original supplier can no longer furnish the item and a suitable alternate replacement can only be furnished as a commercial grade item.
- Delegating the acceptance of a finished commercial grade item either to an original equipment supplier, a third party organization, or the nuclear steam system supplier is more costly than NEK dedicating the item under NEK 10CFR50, Appendix B program.

In order to comply with 10CFR21 "Reporting of Defects and Noncompliance", all commercial grade items shall be dedicated prior to their use in safety related applications. The scope of this policy and the application of the procedures discussed in NEK Program ED-10 ("Program for the Procurement and Dedication of Commercial Grade Items") apply to current and future procurements

Procurement process

NEK procurement process involves various parties inside NEK (TO, ING, NAB, SKV) and outside NEK (Vendors, Manufacturers, Agencies, Regulatory bodies etc.) participating in different procurement scenarios (Basic component procurement, commercial grade item procurement, augmented quality item procurement, NSR item procurement etc.). In order to provide *proper item each time* and to prevent degradation of designed safety and reliability of the NEK plant this process is subjected to strict compliance with 10CFR50, Appendix B and NEK Quality Assurance Program (Criterion's III, IV and VII).

In order to maintain the configuration control of the NEK plant the two basic elements necessary for effective procurement were established:

- Accurate technical and quality requirements specified in order to assure properties or attributes of importance are imparted to the item.
- Acceptance criteria determined in order to provide reasonable assurance that the technical and quality requirements have been met.

Two more items were identified that enhanced the procurement process quality:

- Training of personnel on items such as applicable NRC Regulatory Guides, Generic Letters, Information Notices and Bulletins; NUMARC (Nuclear Management and Resources Council - now Nuclear Energy Institute, NEI) Comprehensive Procurement Initiative; plant-specific licensing commitments, plant design bases, configuration management; and EPRI guidance.
- Communication within utility (e.g. communication between design engineering procurement engineering, quality assurance and control, maintenance, purchasing); with the various suppliers; and with industry organizations. Sharing information is essential for success.

Six steps of procurement process, corresponding to EPRI NP-6629 ("Guideline for the Procurement and Receipt of Items for Nuclear Power Plants", NCIG-15), are addressed in the NEK procedural requirements and responsible parties identified as follows:

- Identification of needed item - maintenance (TO) and modifications (ESD)
- Establishment of technical and quality requirements - engineering (ESD)
- Selection of the procurement scenario and supplier - engineering (ESD/QSD)
- Determination of the acceptance criteria and methods - engineering (ESD)
- Preparation and placement of purchase order - purchasing (NAB)
- Item acceptance - quality assurance/quality control (QSD)

The procedure ADP-1.1.007 ("Equipment, parts, materials, services procurement process") sets for the administrative mechanisms for the procurement of equipment parts, materials, services for the Krško Nuclear Power Plant to ensure that applicable regulatory requirements, design bases, and quality assurance requirements are included or referenced in procurement documents. This is accomplished through implementation of the developed procedures.

The document structure given below relates to Engineering Service Division.

MD-1 NEK Policies and Objectives

QD-1 Quality Assurance Program

PD-1 Procurement Program

ED-1 Design Modifications Control Program

ED-10 Program for the procurement and dedication of commercial grade items

ADP-1.1.007 Equipment, parts, materials, services procurement process

ADP-1.2.006 Engineering in the procurement process

ESP-2.200 Procurement of Materials and Services
ESP-2.201 Component/Spare Parts Classification
ESP-2.202 Replacement Items Technical Evaluation
ESP-2.203 Inter-Utility Transfer of Material
ESP-2.204 Standardization of Equipment, Parts and
Materials Descriptions
ESP-2.205 Establishment of Shelf Life Criteria
ESP-2.206 Procurement, Management and Use of ASME
Code Material, Parts and Components
ESP-2.207 Specification and Dedication of Commercial
Grade Items
ESP-2.617 Engineering Services, Material and
Equipment Technical Specifications

There are five key elements providing overall assurance of item performance that have been identified in NEK procurement process procedures:

- Design and equipment qualification, 10CFR50, Appendix B, Criterion III,. Assures suitability for application per ANSI N45.2.11 (American National Standard - Quality Assurance Requirements for the Design of Nuclear Power Plants)
- Supplier's product controls. Assures items are manufactured/assembled in accordance with the design
- Technical evaluation, 10CFR50, Appendix B, Criterion IV. Assures correct requirements are specified.
- Acceptance, 10CFR50, Appendix B, Criterion VII. Reasonably assures the item received meets specified requirements.
- Post receipt and installation quality controls. Monitors the normal operation and performance of the item.

Commercial grade item

In order to properly describe the process of commercial grade items utilization in NEK nuclear safety-related applications we must understand the definition of the term CGI (commercial grade item) and the background for that definition.

Commercial Grade Item as defined in 10CFR21 Rev.1 1978 is an Item satisfying ALL three criteria:

- Not subject to design or specification requirements that are unique to nuclear facilities; and
- Used in applications other than nuclear facilities; and
- Is to be ordered from the manufacturer/supplier on the basis of specifications set forth in the manufacturer's published product description (for example Catalog).

Commercial Grade Item as defined in 10CFR21 Rev.2 1995

- A structure, system or component, or part thereof that affects its safety function, that was not designed and manufactured as the Basic Component.
- CGI's do not include items where the design and manufacturing process require many in-process inspections and verifications to ensure that defects or failures to comply are identified and corrected (i.e. one or more critical characteristic of the item cannot be verified).

Commercial Grade Item as clarified by Nuclear Energy Institute (NEI, former NUMARC)

- An item is a commercial grade item if its critical characteristic can be verified during dedication process.

NEK has accepted NEI clarification and specifies commercial grade item as an item whose critical characteristic can be verified during dedication process and which imposes no nuclear specification, catalogue shopping and general use by industry.

Critical characteristic

Critical characteristic are those important design, material, and performance characteristic that, once verified, will provide reasonable assurance that the item will perform its intended safety function.

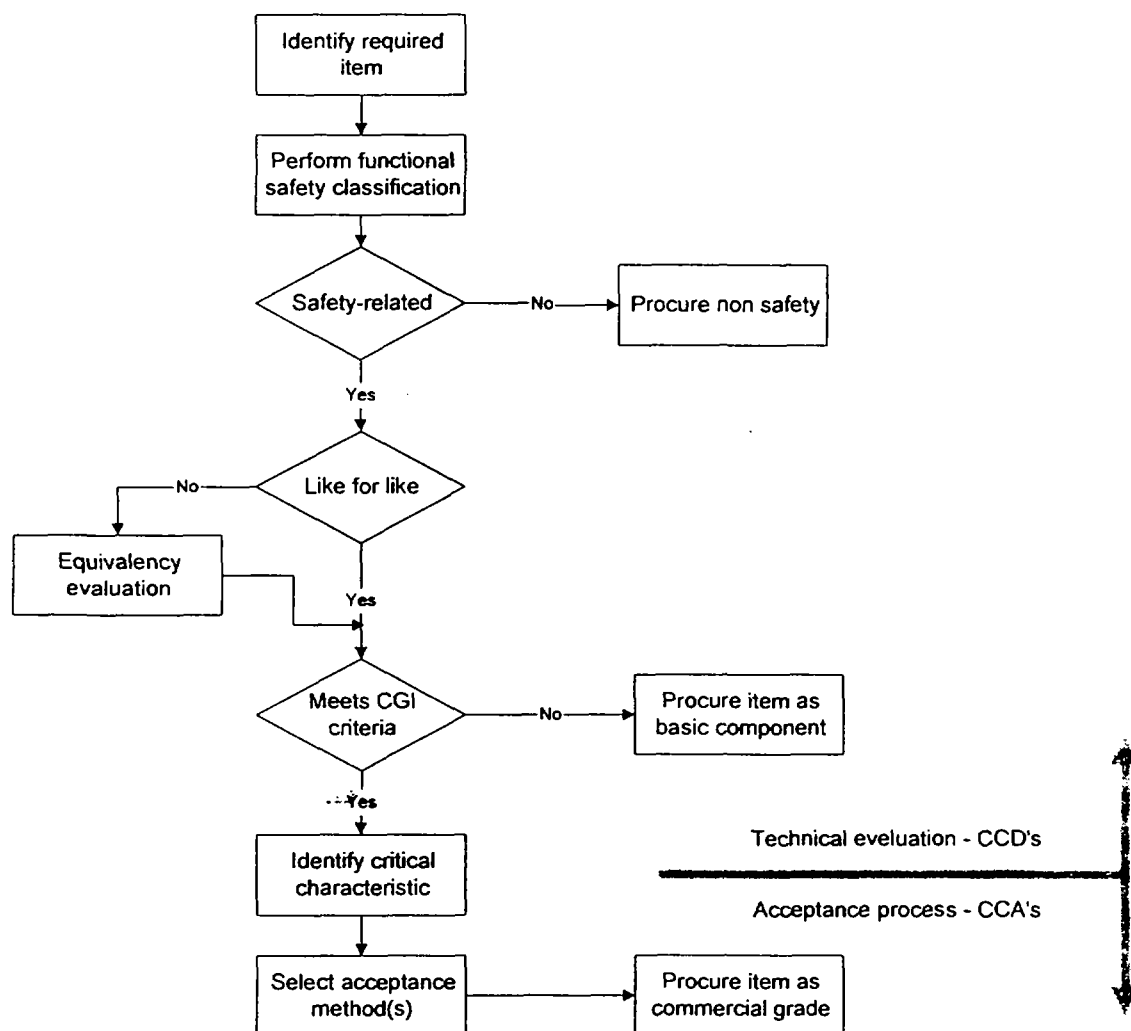
In order to properly select the critical characteristics, the safety classification of that item's designed function has to be determined.

NEK original plant classification of structures, systems and components was based upon codes applicable at the time of construction (ASME, ANSI, IEEE etc.) and that was transferred into plant documentation and licensing commitments. At that time part classification issues were not specifically addressed. NEK procurement process was primarily "Like for Like" from Westinghouse or Original Equipment Manufacturer and conservative in imposing technical and quality requirements.

Recognizing the need to classify parts not only in accordance with manufacturing codes (e.g. ASME) but also based upon the actual function within the plant and especially to prevent that substandard, fraudulent and counterfeit items are installed in nuclear power plants, NRC issued Generic Letters 89-02 "Actions to improve the detection of counterfeit and fraudulently marketed products" and GL 91-05 "Licensee Commercial Grade Procurement and Dedication Programs". Guidance for the USA utilities to make the required enhancements to their procurement processes was provided by NUMARC's "Comprehensive Procurement Initiative".

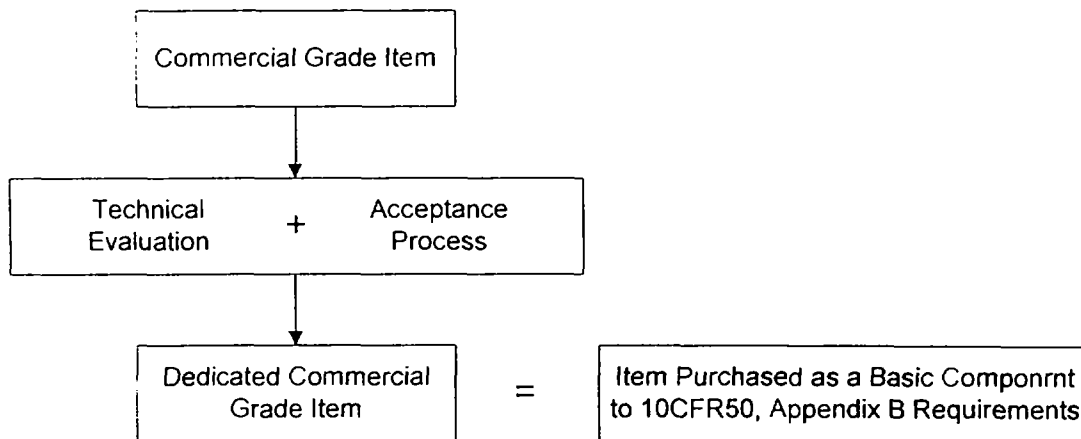
Having most of the nuclear safety equipment with USA origin, NEK adopted the same concept and , among others, developed procedure ESP-2.201 “Component and Spare Parts Classification” utilizing the EPRI NP-6895 (NCIG-17) “Guidance for Classification of Systems, Components and Parts, Used in Nuclear Power Plant Applications” which introduces the functional based safety classification at NEK.

The process of selecting critical characteristics based on the functional safety classification of items is performed through a technical evaluation process. As a part of procurement process technical evaluation is based on EPRI NP-6404 (NCIG-11) “Guidance for the Technical Evaluation of Replacement Items in Nuclear Power Plants” and transferred to NEK procedure ESP-2.202 “Replacement Items Technical Evaluation”. Two types of critical characteristics are determined during technical evaluation process: Critical Characteristics for Design (CCD) and Critical Characteristic for Acceptance (CCA).



Dedication

Dedication is an acceptance process undertaken to provide reasonable assurance that a commercial grade item to be used as a basic component will perform its intended safety function and, in this respect, is deemed equivalent to an item designed and manufactured under a 10CFR Part 50, Appendix B, quality assurance program. This assurance is achieved by the purchaser through identifying the critical characteristic of the item and verifying their acceptability by inspections, tests or analysis.



NEK Procedure "Specification and Dedication of Commercial Grade Items" (ESP-2.207) sets for the NEK acceptance process practices through the following methods:

- Special tests and inspections Method 1
- Commercial grade survey Method 2
- Source verification Method 3
- Supplier/item performance record Method 4
- Combination of two or more of the four methods

These are four different ways to verify critical characteristic as developed by EPRI and endorsed by NRC. Because of lack of historical data Method 4 is currently not recommended as an acceptance process at NEK but it can be used for sampling plan optimization when commodity items are purchased as CGI and are subject to a statistically based dedication acceptance process.

The dedication of the commercial grade item should not be mixed with the qualification process. The dedication process serves to verify that the item received is the item required (purchased). The qualification process serves to demonstrate and verify that the item will perform its designed function.

Conclusion

NEK has several reasons for the utilization of commercial grade item procurement and dedication in its procurement cycle. These are:

- Nuclear vendor drops qualification
- Original parts not available - replacement parts are offered non qualified
- Discrepancies between Manufacturing and Operations codes/standards
- Reduced cost and lead time
- Falsified/Fraudulent items and documents

Development of tools (procedures, methodologies and computer applications) and personnel training programs present NEK investments into the future when the CGI procurement will have no alternative because qualified parts and suppliers will not be available. In this early phase the following limitations are to be considered when applying the Commercial Grade Dedication process:

- Simple items
- Qualified product not available
- Not above but all NEK requirements can be met:
 - Identified critical characteristic (including seismic) can be verified against known acceptance criteria
 - Test/inspection equipment and qualified personal is available
 - Significant cost reduction
- Purchasing to specific application
- Available resources

A survey performed by “Elektroinstitut Milan Vidmar”, Ljubljana; within the Slovenian industry and research institution laboratories has shown that significant resources for inspections and tests are available but some additional effort will be needed in order to generate and approve necessary specific procedures.

Acceptance criteria are often vendor proprietary data so information exchange of NEK with US Utilities, NUPIC and EPRI memberships as well as vendor surveys performed by NEK itself will be of increased importance for the successful implementation of CGI dedication.