DEVELOPMENT OF CABLE AGING MANAGEMENT PROGRAM AND EQUIPMENT QUALIFICATION IMPROVEMENT FOR LAGUNA VERDE NUCLEAR POWER PLANT

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\section*{Abstract}

The EQ Group/LVNPS and the Instituto Nacional de Investigaciones Nucleares (ININ) are working on the project to develop the cable aging management program (AMP) as part of the technical basis to extend the operational life, through the plant license renewal. Also they are working to carry out activities to improve the Equipment Qualification Maintenance Programme (EQM Programme).

A cable tests program is running at the EQ Lab in ININ to perform accelerated aging until 60 years to obtain the base line data and to match with the current cable status at the plant and validate the predictive aging models identifying required actions, monitoring programs and methods to estimate remaining life. ININ is preparing the methods and the procedures to apply condition monitoring techniques during the accelerated tests program on samples of new cables from the LVNPS warehouse.

The EQ Group/LVNPS is performing the revision and updating of EQ and related procedures, new EQ documents are being prepared based on this revision (EQ manual, procedures, etc.). The EQ data system is being updated and the establishment of complementary programs is being prepared (qualified life extension, environmental monitoring, spare parts standardization and obsolescence studies).

\section{Introduction}

All materials suffer a process of aging due to several physical factors. Aging is the process of degradation of basic functions in materials. The aging process can be natural or accelerated by the presence of physical factors called stressors. Temperature and radiation make the polymeric insulators be embrittlement in the electrical cables. In the ending of cables can be corrosion due to galvanics pairs, and overheating by loss electrical connections.

Laguna Verde Nuclear Power Station (LVNPS) in Veracruz Mexico has an operational licence for 40 years. The plant is planning to extend the operative life until 60 years, then, to get this life extension, it is necessary to guarantee that Systems, Structures and Components (SSC’s) are within a functional safety margin. Mainly those nuclear safety related who are in hazard zones. In order to reach this goal an Aging Management Program (AMP) will be implemented.

As a first step to reach this goal, LVNPS along with ININ, generated an IAEA project. The project is identified like “PLIM CLV-OIEA-ININ MEX-053/54”. The project considers several SSC’s for a pilot study and control cables are included. In this project a cable AMP
will be prepared through the condition monitoring of cables installed in the plant. With these activities it is possible to detect any deviation in the normal aging process of cables and to identify the stressors that could generate the failures by aging and to be able to mitigate them or determine the component replacement period. Also it is necessary, to be sure that the functional margins of security will have to be conserved. If the accelerated aging of the components is not mitigated early, the safety margins will be reduced in accelerated form and there will be a greater probability that appears dangerous events for the security and public health. The aging is related to the failures of components, see Figure 1. In order to obtain references of cables condition indicators, accelerated aging of new cable samples will be performed at the ININ laboratories. The tests results obtained from the cable samples aged for different periods (20, 30, 40, 50, 60 years) will be useful to build a data base of diagnosis indicators of cables condition monitoring in the plant.

FIG. 1. Component Safety Level vs Time.

2. Methodology for AMP of Cables

Aging management of important components for the plant security, means to predict and/or to detect, when a component of the plant has been degraded at a level so the safety margin has been reduced lower than the previous established reference and in this case, it is necessary to take remedial or mitigation actions. In order to establish the cables AMP, it will be required a methodologic and systematic process, that consists of three great steps. 1) Selection of components. 2) Aging Management Studies and 3) Initiatives for Aging Management.

The selection of component has been done following the recommendations and technical guides [1][2][3], considering mainly safety related control cables that are installed in hard environment. The cables for those environmental zones are described in the Final Safety Analysis Report (LVNPS FSAR). The most severe environmental conditions are in the Primary Containment and the qualification of the installed cables have been performed according to the 10.CFR 50.49 and IEEE-323, IEEE-383 Std’s. The models of selected cables are included in Table 1.
Table 1  Description of LVNPS Cables Samples

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROCKBEST OS</td>
<td>2/C 12 AWG COPPER ROCKBESTOS-SUPRENANT (G) 600V 90 DEG. C F FIREWALL(R) III XHHW-2 SUN RES DIR BUR OIL RES II NEC TYPE TC (UL) XLPE CSPE FT4 C52-0020 2004 003324 FEET 4C-965</td>
</tr>
<tr>
<td>ROCKBEST OS</td>
<td>3/C 14AWG COPPER ROCKBESTOS-SUPRENANT 600V 90C FIREWALL (R) III XLPE CSPE FT-4 C53-0030 (03).</td>
</tr>
<tr>
<td>CONDUMEX</td>
<td>EP-FR 9x12 AWG 600V CONDUMEX COPPER (79) TYPE HJ D50-58 9/C</td>
</tr>
<tr>
<td>PIRELLI</td>
<td>PIRELLI RADIFLAM EP D50-59 600V 3X16 AWG (99)</td>
</tr>
<tr>
<td>CONDUMEX</td>
<td>CONDUMEX EP-RF+CUB. AFUMEL 5X16 AWG 600V 1991, TYPE K1 D50-70</td>
</tr>
<tr>
<td>CONDUMEX</td>
<td>CONDUMEX EP-RF+CUB. AFUMEL 2X16 AWG 600V (92) TYPE K1. D50-79</td>
</tr>
<tr>
<td>CONDUMEX</td>
<td>CONDUMEX EP-RF+CUB. AFUMEL 1X2X16 AWG 600V (91) TYPE L2 D60-54.</td>
</tr>
</tbody>
</table>

Table 2 shows the environmental conditions (radiation, temperature, pressure, relative humidity and radiation dose) for normal service operation and Design Basis Accident (DBA).

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>NORMAL</th>
<th>ACCIDENT (DBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>135ºF (57ºC)</td>
<td>340ºF</td>
</tr>
<tr>
<td>Pressure</td>
<td>-0.5 to 2.0 psig</td>
<td>-2 a 45 psig</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>40-55 %</td>
<td>Steam</td>
</tr>
<tr>
<td>Radiation Dose</td>
<td>2.6x107 Rads</td>
<td></td>
</tr>
</tbody>
</table>

The aging management studies, involves three phases:

a) Understanding of degradation process for aging.
b) Monitoring of aging to detect the degradation before a fault occurs.
c) Early mitigation of anormal aging and its efects.

The understanding of the degradation process for aging, involves three elements: research of aging mechanims, root cause anylisis and post service tests.

Related to the aging monitoring to detect the components degradation before they fail, it will be considered monitoring methods recommended by technical guides. Some of the most important are periodical inspections, tests, monitoring in line and data assessment.

The selected tests to obtain the indicators of the material condition (insulating material and jacket) in control cables are: visual and tactil tests, mechanical tests (elongation at break, indenter), chemical tests (OIT), electrical tests (insulation resistance, polarization index). [1][3][4][5].

Table 3 presents a tests list to obtain the cables condition indicators. These tests will be applied to LVNPS cable samples that have been aged in acelerated way at the ININ laboratory.
by different time periods. With these samples, the base line reference values will be get to compare with the parameters of the installed material in the plant.

Table 3  Selected Tests for Condition Monitoring of Cables Insulation Material

<table>
<thead>
<tr>
<th>No.</th>
<th>TEST</th>
<th>STANDARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>POLARIZATION INDEX</td>
<td>ASTM D257</td>
</tr>
<tr>
<td>3</td>
<td>ELONGATION AT BREAK AND TENSIL STRENGTH</td>
<td>ASTM D638, D412, ICEA S-68-516 (NEMA WC8)</td>
</tr>
<tr>
<td>4</td>
<td>INDUCTER MODULUS</td>
<td>EPRI TR-102399, NUREG/CP-0135</td>
</tr>
<tr>
<td>5</td>
<td>HARDNESS</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>DENSITY</td>
<td>ASTM D792, ASTM D1505, ASTM E1441, ASTM E1570</td>
</tr>
<tr>
<td>7</td>
<td>OXIDATION INDUCTION TIME (OIT)</td>
<td>ASTM D2333, ASTM D3895, ASTM D4565</td>
</tr>
<tr>
<td>8</td>
<td>FOURIER TRANSFORM INFRARED SPECTROSCOPY</td>
<td>ASTM D2140</td>
</tr>
</tbody>
</table>

To obtain the indicators of the cables condition, new cable samples will be aged at ININ. The results of the aging tests for different periods will be integrated in an indicators data base to prepare diagnoses for the monitoring of cables installed in the plant. Table 4 shows the accelerated aging plan to be applied to the new cables samples. The table indicate presents the number of samples that will be aged by temperature and radiation and submitted to Loss of Coolant Accident (LOCA) conditions.

Metallic stands have been prepared to place cable samples and to age them into the ovens at the ININ.[6]. At the present time the oven thermal profile has been determined considering the complete internal volume of the oven and several improvements were performed to get an homogenous temperature distribution. In Figure 2 picture to the left shows the metallic stand for cables samples and the picture to the right shows a LVNPS multiconductor control cable sample.

At the present, tests procedures are in preparation of condition monitoring, to guarantee the repeatability in the conditions and the way to run the tests during the different.

The planned activities for cables AMP are indicated in the diagram of Figure 3. These activities are in progress. Some of them are: 1) Perform reference tests for condition monitoring. 2) Generate an information system that includes basic information for cables, operative experience, maintenance registries in a data base. 3) Analyze service condition that includes operative monitoring and environmental monitoring. 4) Carry out condition monitoring, preparing tests procedures for the samples removed from the plant and during walkdowns. With these information will be integrated to evaluate the aging of cables to be able to diagnose and to make mitigation actions for stressors or maintenance tasks (corrective or replacement of component), in order to preserve the security margin in SSC’s.
**Table 4**  Plan of Accelerated Aging for New Cable Samples

<table>
<thead>
<tr>
<th>ACCELERATED AGING PERIOD (years)</th>
<th>NUMBER OF CABLE SAMPLES (Segments of 35 cm)</th>
<th>THERMAL AGING</th>
<th>RADIATION</th>
<th>DBA EXPOSURE (LOCA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>12</td>
<td>6 *</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>20</td>
<td>12</td>
<td>6 *</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>30</td>
<td>12</td>
<td>6 *</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>40</td>
<td>18</td>
<td>12 *</td>
<td>6 **</td>
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<tr>
<td>50</td>
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<td>12 *</td>
<td>6 **</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>18</td>
<td>12 *</td>
<td>6 **</td>
<td></td>
</tr>
</tbody>
</table>

* Extracted samples from 12 cables group aged by temperature.
** Extracted samples from 12 cables group aged by temperature and radiation.

**FIG. 2.** Metallic Stand for Cables Samples and Sample of Control Cable
3. LVNPS Equipment Qualification Program

The Equipment Qualification Maintenance Program (EQMP) of the Laguna Verde Nuclear Power Plant (LVNPS) was started in 1985 with the review of the status of the Environmental Qualification of the safety-related equipment to verify the compliance with NUREG-0588 Category I requirements. The EQ Group reviewed all the documents that support the seismic-environmental qualification of the Class 1E equipment installed at the plant, to assure the procurement and plant maintenance documents include the requirements needed to preserve the equipment qualification during their installed lifetime, in accordance with IEEE-323 [7] and IEEE-344 [8]. The following main activities were also carried out:

a) Preparation of the procedure to carry out the EQ process at LVNPS.

b) Preparation of the specification for the environmental qualification tests.

c) Approval of ININ as EQ tests services supplier for LVNPS.

d) Tests re-qualification at ININ of pressure and level transmitters and breakers and solenoid valves.

e) Preparation of EQ additional reports for equipment installed at the plant with incomplete documents and records.

3.1. EQ Program to comply with the license requirements of LVNPS Unit 1

At the beginning of 80’s at the LVNPS there was a lack of information and traceability of support documentation to adequately comply with the licensing commitments for the start-up of the plant, so a work program was set out to comply with the commitments of the Mexican Regulatory Body. This program consisted of carrying out a detailed review of the EQ status at the LVNPS, preparing audit files and working on the requalification of some equipment.

3.2. Maintenance of Equipment Qualification at the LVNPS

The implementation of the EQ Maintenance Program (EQMP) at the LVNPS takes place through a structured organization in a semi-formal way by two independent areas: Operations and Engineering. At present the EQ Group is directly responsible for the management of the EQMP at the LVNPS and is carried out in three different stages

Stage 1: EQ Specific Plant Evaluation

The EQ Group evaluates the EQ documents provided by the supplier versus the requirements specified for the LVNPS, in order to prepare the EQ Reports that will be the basis to issue the EQ Maintenance Requirements.

Stage 2: EQ Maintenance Requirements
The EQ Maintenance Requirements (EQMR’s) are documents issued by the EQ Group where the detailed technical information of components is established to maintain the environmental qualification valid as per brand and model of the Class 1E equipment installed in Units 1&2. The EQMR’s include the Tags of the equipment to carry out inspection, measuring and tests activities as well as part replacement of degradable spare parts and the frequency that applies to each activity. The information of the EQMR’s is summarized in documents called Annexes to the EQMR’s that are issued and sent to the Operation staff of the plant.

**Stage 3: Implementation of the EQ Maintenance at the LVNPS**

The Annexes of the EQMR’s are reviewed and approved by Operations staff of the plant and are scheduled and applied as Maintenance Requests. These activities are carried out according to specific procedures for Units1&2.

**3.3. Implementation of the EQ Maintenance Requirements**

They establish the special maintenance requirements and the necessary replacements for the qualified configuration of the plant to be preserved. The EQMR’s mainly contain the following information: generic information, storage requirements, maintenance activities, operational experience, recommendations, additional recommendations to the eq maintenance requirements, references.

**3.4. Annexes of the EQ Maintenance Requirements**

They contain in a summarized and accurate way, information on the installation, assembling and de-assembling, inspections, calibration, lubrication and substitution, applicable to the maintenance activities through the Maintenance Requests.

**3.5. Computerized Control System of the EQ Maintenance Requirements**

The LVNPS developed the Computerized Control System of the EQMR’s (software), to control the actions that must be implemented to maintain the equipment qualification of Class 1E equipment at the plant, as well as issuing reports to specify the last dates of maintenance of the qualification carried out and the next dates to carry out the maintenance for a particular equipment. The EQMR’s System is an application of the data management such as storing, recovering and analyzing the information regarding the maintenance of Class 1E equipment through the EQMR’s Annexes.

**4. Improvement Proposals for the EQ Maintenance Program at the LVNPS**

The EQMP implemented at LVNPS basically complies with the 10CFR50.49 Environmental Qualification regulation [9] and the R. G. 1.89 [10] and to date, the actions that are carried out cover the most important aspects for the implementation of the qualification maintenance at the LVNPS. It also contains the specific procedures and documents to carry out the tasks of the EQMP.

The LVNPS/EQ Group together with the ININ is carrying out actions aimed at the EQMP being applied in the most efficient way and so that communication with the Plant Operation.
may be most effective [11]. These actions are aimed at optimizing specific points for the maintenance of the LVNPS. The main topics that are subject to improvement are:

A) **Review of the Organization** to incorporate officially the functions and responsibilities of the personnel directly involved in the maintenance of the EQ at the LVNPS.

B) **Revision and Updating of Procedures**, in order to incorporate the necessary steps to comply efficiently with the Regulatory Body commitments, simplify and expedite the issue of EQ documents and sharpen up in the procedures to improve the communication and feedback of information between the LVNPS groups involved in the EQMP.

C) **Preparation/up-date of EQ documents** issued with the review of the procedures indicated in item B) above.

D) **Preparation of an EQ Documents Electronic Library.**

E) **EQ complementary work programs**, to optimize the qualification maintenance requirements, having as a basis the studies of the extension of the qualified lifetime, supported in the feedback information on the true behavior of the LVNPS and the equipment, as well as the experience of other plants when developing monitoring programs of environmental conditions and the status of the equipment and studies on failure tendency.

ININ has been working with the LVNPS in the improvement proposals that are described below. Some of them have already been implemented and others are being carried out.

### 4.1. Proposals for the Organization of the EQ Maintenance Process

Up to some time ago, the industry was interested in establishing the qualification and submitting the corresponding evidence to the Regulatory Body. In the majority of the nuclear plants, only Engineering was involved in the process to establish EQ. At present the objectives have changed to establish the qualification of the maintenance for its maintenance and so several work groups within the LVNPS organization must participate. The surveillance and the adequate maintenance of the safety related equipment are key factors to preserve the qualification.

ININ proposed to the LVNPS a scheme for the general process of the EQM that is based on the experience of other plants and that adapts itself to the current organization of the plant. As a first step the recommendation was made that officially at the LVNPS an internal organization responsible for the EQMP which, with adequate and updated procedures would maintain an effective flow of information with Operation and the groups of the plant that would so require it, including a full time EQ Coordinator to act as liaison among all the LVNPS/Operation groups related to the maintenance of EQ and the EQ Group, at the same time, will involve the corresponding Engineering Groups.

### 4.2. Improvement Proposals to the Main Topics of LVNPS EQMP

In order to improve the EQMP with respect to items B), C) and D), mentioned at the beginning of this chapter, ININ proposes that the activities are carried out and the documents that are indicated in this section for the main EQ topics are prepared.
**Topic I: EQ PROGRAM**

**Proposal 1. Up-dating of the EQ General Procedure at the LVNPS (In process):**
This procedure will as a minimum include: the EQ scope at the LVNPS, all the activities to be carried out under the EQ Program, responsibilities of each group participating in the EQ process, lines of communication and applicable procedures. It will be possible to record in an official way the EQ actions required by 10CFR50.49, integrate into only one document all the actions of the EQ Program, easy access availability of information for the staff involved in the EQ related tasks, man-hour savings by having a direct consultation document and an applicable procedure for the training of personnel.

**Topic II: EQUIPMENT QUALIFICATION MASTER LIST**

**Proposal 2. Preparation of the List of Qualified Equipment in Units 1 & 2 (Finished).** An environmentally qualified equipment data base was prepared, detailing in a procedure its structure, scope, the technical equipment information, how this information was obtained and the records that were created and how they conform with the database for consultation and updating. The EQ List has been prepared by ININ and is available in the LVNPS databases, complying with 10sCFR50.49 IAEA-CN-155-045

**Topic III: EQ TESTS AND ANALYSIS**

**Proposal 3. Procedure Preparation for Plant-Specific Evaluation of Qualification and to Issue the EQ Documents Packages (In Process)**
A procedure is prepared to indicate the actions required to carry out the evaluation of the EQ reports provided by the manufacturer for the LVNPS specific conditions with the aim of including in a precise manner the parameters directly related to the application of the EQ criteria. The results of these revisions will generate EQ Evaluation Reports and the EQ MR’s for LVNPS. The procedure will also indicate the structure and formats of the EQ Evaluation and EQ Maintenance Reports and also, their control and updating. Based on this procedure ININ is reviewing the existing EQ Evaluation Reports and the EQMR’s to update the EQ Maintenance Reports. The EQ Reports from the supplier, the EQ Evaluation Reports and the EQMR’s updated, will integrate the EQ Documents Packages for LVNPS Units 1&2 qualified equipment families.

**Topic IV: EQUIPMENT QUALIFICATION MAINTENANCE**

**Proposal 4. Review of the EQ Related Procedures for the New EQ Program Implementation at LVNPS (In process).**
The review of the following main procedures is proposed by ININ, in order to adapt the objectives and scopes procedures to the activities in the Updated LVNPS EQMP.

a) **Revision of the current EQ Procedure** to relate in a more direct manner the EQ Reports, the EQMR’s and the EQ Evaluation by Engineering Modifications with a structure that will only contain the EQ information and then they can be handled expeditedly and directly, avoiding that they may be issued based on subjective concepts.

b) **Review of Operation Procedures** to include the necessary activities and responsibilities for the EQ Group to officially receive, as feedback, the

IAEA-CN-155-045
information issued by the application of the EQMR’s, corrective maintenance that affects the qualified equipment and plant problems that might impact the LVNPS qualified status.

c) **Review of the Maintenance Procedures** to verify that the actions set out in the EQMR’s have been adequately incorporated in order to avoid actions that might affect the qualified status of the equipment installed. There will also be reviewed that the actions to inform Engineering on the modifications related to spare parts and their evaluation of the impact on the equipment qualification.

d) **Review of the Storage Procedures** to verify that the storage requirements to maintain the qualified status of the equipment and spare parts that will be used as replacements in the EQMR’s are included.

e) **Preparation of an EQ Electronic Library** that contains the EQ procedures and documents in order for them to be consulted and updated by the LVNPS personnel expedite and efficiently.

**4.3. Complementary program proposals**

The plant-specific evaluation of equipment qualification has been carried out considering mainly plant design data, which are very conservative and so it will be very valuable for the LVNPS to make a re-evaluation based on current data of the

IAEA-CN-155-045

plant experience. Based on this and in accordance with what is set out in item E) at the beginning of this chapter, two complementary programs are being proposed: Environmental Conditions Monitoring and Equipment Status Monitoring. These programs can contribute to preserve more realistically the qualified status of the equipment and foster the reduction of costs in the buying of replacement equipment and spare parts, as the qualified lifetime of the installed equipment has been better determined.

a) **Environmental Conditions Monitoring (In process).**

The main objective is to design and implement the monitoring of current environmental parameters in specific places at the plant under normal service conditions. The temperature, radiation and humidity levels are important to determine the qualified lifetime of the equipment which has been established at the LVNPS considering high (conservative) levels. The value of the qualified lifetime equipment can be extended if the current service conditions levels are less than those originally assumed. Eventually local areas with environmental parameters of higher value than the design ones could be found. In this case, actions can be proposed to decrease these conditions or else to review the qualified lifetime assigned. In the case of LVNPS the thermal aging has a greater influence in determining the qualified lifetime for the equipment and components, the environmental conditions monitoring has been proposed starting with the record of environmental and contact temperatures in the equipment and some sites at the plant that provide greater confidence regarding the qualified lifetime determination and could have probable lifetime extensions.

b) **Equipment Condition Monitoring Program.**

The qualified equipment maintenance actions such as repair and replacement of spare parts can preserve the equipment under a “as new” condition or else under a condition studied before the simulation of exposure to a DBA. During maintenance tasks there can be verification and follow-up can be provided for the performance or functioning of physical features of the installed equipment, through inspections, surveillances and the monitoring of the true condition of the equipment. These actions and the tendency
of the selected functional parameters can potentially increase the knowledge of the aging effects and the reliability in the correct operability of the equipment. From this point of view, a program to evaluate the failure data of the installed equipment is proposed to determine the feasibility of the condition monitoring techniques. With this program, the failure mechanisms not considered during the aging simulation for the equipment qualification will be identified and information to determine an excessive or unexpected degradation will be obtained. There will be data and feedback information to carry out failure tendency studies of specific equipment, maintenance actions that induce degradation or a mal-functioning of the specific equipment will be identified and there will be a greater reliability in the performance of the installed qualified equipment according to the progress of its qualified lifetime [13], [14].

5. **Enhancement of LVNPS EQ Maintenance Program Conclusions**

The qualified status maintenance of a nuclear power station is an operating licensing requirement. Based on this the continuous optimization of an EQ Program leads to a safe, and reliable operation with high possibilities of reducing costs in the maintenance of the qualified state. The more a nuclear plant ages, the normal tendency is to increase the maintenance costs and there is a higher probability that the safety and reliability of the plant operation, may decrease. Given the fact that LVNPS has already had 17 years of continuous operation and that the lifetime extension of the plant is being proposed, working programs are started to preserve the safe and profitable operation of the plant in a time period longer than 40 years lifetime, thus making its processes more efficient without deterioration of the safety required conditions. The development and implementation of the improvement proposals at the LVNPS which ININ is carrying out at the plant have the following main benefits:

- To cleanse and determine in a precise way about the actions, functions and responsibilities of the different groups involved in the EQ Program.
- To improve the flow of information between the EQ participating groups.
- To obtain true and continuous knowledge of the behavior of the qualified equipment at the plant.
- To optimize the EQ Maintenance Requirements through true information provided by the plant.
- To minimize discrepancies with the requirements set out in the nuclear regulation.
- To reduce the man-hours in the use, consultation, and updating of EQ documents which have been changed into electronic format.
- To reduce costs through the implementation of lifetime extension programs and the failure analysis of qualified equipment.
REFERENCES


