Prior to the electrical connector assembly failures during the 1977 Sandia methodology tests the NRC's program related to equipment environmental qualification consisted of a review of the Safety Analysis Report to verify that the licensee committed to meet the appropriate standards and in-house review of some equipment qualification reports. Following the investigation of the connector failures several Bulletins were issued that uncovered the generic problem of gross inadequacies in safety-related equipment environmental qualifications. The current program for operating plants consists of reviewing the licensees responses to IE Bulletins and reviewing a backlog of environmental qualification reports submitted for equipment installed in operating plants. Effort under the current program has been aimed at catching up with the equipment qualification inadequacies in operating plants.

On April 13, 1978, the Commission issued a memorandum and order to the staff that included ten directives resulting from the Union of Concerned Scientists petition dated November 4, 1977. Directive #5 of that memorandum and order stated:

"Provide the Commission with an analysis of alternatives (including estimates of resource requirements and potential benefits) for conducting independent verification testing of environmentally qualified equipment which is required to operate in safety systems. Alternatives to be provided for information of the Commission in one month, with the full analysis to be completed one month later."

On June 14, 1978 the NRC staff's plan for the analysis was submitted to the Commission in Information Report SECY-78-310. The plan consisted of an analysis of the following three alternatives each representing a course of action that provides greater NRC involvement in equipment environmental qualifications than presently exists:

(1) NRC environmental test facility

(2) NRC contract environmental testing to existing DOE or independent laboratories

(3) NRC review and witnessing of vendor tests conducted to meet NRC requirements.

Combinations of these alternatives were also considered in search of the optimum method of monitoring and controlling the adequacy of equipment qualifications. Sandia Laboratories performed the study of the alternatives in accordance with the plan developed by the staff.

Sandia completed the study and their bottom line recommendation emphasized the need for immediate NRC action and the need for continued study of the longer range activities to assure the adequacy of equipment environmental qualifications.

Precisely, Sandia recommended the following:

(1) A dedicated autonomous NRC staff, at least at a Branch level, be established immediately to be responsible for reviewing, witnessing, evaluating, and approving all safety-related equipment qualification programs.

(2) Within 6 to 12 months after its inception, the dedicated staff should be supplemented with sufficient additional staffing to continue this study, to define and implement, the longer range activities.

(3) Strong consideration should be given to the "optimal" alternative, i.e., a combination of Alternative 1 and 3.

Following the Sandia study the NRC established a dedicated branch that has overall responsibility for coordinating equipment qualification programs.

The NRC staff continued the Sandia study and proposed a program designed for short range and long range results.

The short range program will monitor and control equipment qualifications through the following activities:

(1) performing indepth inspections and witnessing of selected equipment qualifications,

(2) performing selected independent verification testing.

During implementation of the above program activities the following long range program activities will be developed and implemented to assure the quality and efficiency of equipment qualifications:

(1) standardization of qualification criteria,

(2) accreditation of testing laboratories,

(3) improvement of test standards, specifications, procedures, and acceptance standards,

(4) consider the addition of other equipment requiring qualification by test into this program.

On September 16, 1980 the Commission formally authorized the staff to develop and implement the program for conducting independent verification testing and inspection of environmentally qualified equipment.
equipment and approved the initiation of the
laboratory accreditation program.

The scope of the program includes all
environmentally sensitive safety-related equipment
located in areas potentially exposed to a harsh
environment, and required to function during or
following an accident for safe plant shutdown, or
required to mitigate the consequences or an accident.
Specifically, the program covers safety significant
electrical, instrumentation and control equipment
intended for installation in plants under construction
and replacement or requalified equipment for plants
in operation.

In September, the NRC ordered utility operators
of nuclear power facilities to submit information
showing that safety-related equipment in their
facilities can withstand the severe environmental
conditions that could result from a serious accident.
The NRC staff will review this information and issue
safety evaluation reports early next year.

The NRC requires that samples of equipment that
could be subjected to a harsh environment be tested
in an equivalent environment or that the facility
owners prove by analyses based on existing test data
that the equipment is qualified.

As part of its overall equipment qualification
program, the NRC will inspect and review in-depth
the industry test programs of selected critical
components. This will include an NRC review of
equipment specifications, test plans, test procedures
and acceptance standards before the industry's
qualification tests are performed. The NRC will also
witness the assembly and preparation of specimens,
review the test set-up and witness the actual
qualification tests. This review and inspection of
the on-going qualification tests will afford the NRC
the opportunity to ensure that necessary changes or
adjustments are made before the work is completed.

In addition to its audit of industry test
programs, the NRC will conduct independent qualifica-
tion tests of important equipment to verify the
industry results. To the extent practicable, the
NRC tests will be conducted on equipment which has
been in use in a nuclear power facility. When this
is not practical, specimens will be obtained from
stock designated for a nuclear power facility,
artificially aged and then tested.

The NRC is preparing a new rule that will
address the subject of equipment qualification in
detail. This rule will provide specific guidance and
requirements for meeting the Commission's present
General Design Criteria for nuclear power plants.
One of the requirements will be that future
environmental qualification tests be performed in a
laboratory accredited for that purpose. Accredited
laboratories could be operated by equipment
manufacturers, utilities, independent research and
development institutes, universities and independent
testing laboratories. The NRC currently is working
with the Institute of Electrical and Electronics
Engineers and the American Society of Mechanical
Engineers to initiate a laboratory accreditation
program. Initially the program will review the
capabilities of laboratories already conducting
environmental tests on equipment for the nuclear
industry. Its purpose is to achieve greater
uniformity and consistency in the testing process
regardless of the specific interest of the testing
organization.