PARTIAL REVIEW

Equipment Evaluation Report By the
Office of Nuclear Reactor Regulation

For Rochester Gas & Electric Corp.
R.E. Ginna Nuclear Power Station
Docket No. 50-244

Environmental Qualification of Safety-Related
Electrical Equipment

Dated: February 11, 1981

(PARTIAL REVIEW)
EQUIPMENT EVALUATION REPORT BY THE
OFFICE OF NUCLEAR REACTOR REGULATION

FOR ROCHESTER GAS & ELECTRIC CORP.
R.E. GINNA NUCLEAR POWER STATION
DOCKET NO. 50-244
ENVIRONMENTAL QUALIFICATION OF SAFETY-RELATED
ELECTRICAL EQUIPMENT

3.0 STAFF EVALUATION

The staff's evaluation of the licensee's responses included an on-site inspection of selected Class IE equipment and by examining the licensee's report for completeness and acceptability. The criteria described in the DOR Guidelines and NUREG-0588, in part, were used as a basis for the staff's evaluation of the adequacy of the Licensee's qualification program.

During the week of May 5, 1980, NRC and FRC representatives visited the Ginna plant site, inspected safety-related systems and equipment identified and tabulated safety-related components through discussions with plant personnel, and conducted a general review of RG&E's submittal of Apr. 25, 1980. The inspection verified proper installation of equipment, overall interface integrity, and manufacturers nameplate data. The manufacturer and model number from the nameplate data was compared to information given in the Licensee's submittal.

The following evaluation incorporates the RG&E submittal and the Franklin Research Center technical evaluation report (TER).

3.1 COMPLETENESS OF SAFETY-RELATED EQUIPMENT

In accordance with the DOR guidelines, the licensee was directed to establish a list of systems and display instrumentation needed to mitigate the consequences of a LOCA or HELB, inside or outside containment, and reach safe shutdown. The lists of safety-related systems and display instrumentation were developed from a review of plant safety analyses and emergency procedures. The display instrumentation selected includes parameters to monitor overall plant performance as well as to monitor performance of the systems on the list. The systems list was established on the basis of the functions that must be performed for mitigation of the consequences of a LOCA or HELB without regard to location of equipment relative to a potentially hostile environment. The staff has determined and verified that the systems considered by the licensee are those required to achieve or support: (1) emergency reactor shutdown, (2) containment isolation, (3) reactor core cooling, (4) containment heat removal, (5) core residual heat removal, and (6) prevention of significant release of radioactive material to the environment. In addition to the concerns identified below the staff's systems review has not included those equipment items discussed in section 5.0 of this report. The systems and instrumentation list is contained in Appendix D.

The licensee submitted an extensive list of safety-related electrical equipment. This list was evaluated and identical components within a plant area exposed to the same environment were grouped; 44 item types of equipment were identified and assessed by the staff. The licensee has also identified certain equipment items as providing important safety functions, but has not included them in the list of equipment that must be qualified. Justification for the omission should be presented.

3.2 Service Conditions

The Commission Memorandum and Order (CLI-80-21), dated May 23, 1980 requires that the DOR Guidelines and the "For Comment" NUREG-0588 are to be used as the criteria for establishing the adequacy of the safety related electrical equipment environmental qualification program. These documents provide the option of establishing a bounding pressure and temperature condition based on plant specific analysis identified in the licensees FSAR or based on generic profiles using the methods identified in these documents.

On this basis the staff has assumed, unless otherwise noted, that the analysis for developing the environmental envelopes for Ginna relative to the temperature, pressure, and the containment spray caustics, have been performed in accordance with the above stated requirments. For this review the staff reviewed the qualification documentation to ensure that the qualification specifications envelope the conditions established by the licensee. During this review the staff assumed that for plants, designed and equipped with an automatic containment spray system, which satisfies the single failure criterion, the main steam line break environmental conditions are enveloped by the large break LOCA environmental conditions. The staff assumed and requires that the licensee verifies, that the containment spray system is not subjected to a disabling single component failure and therefore satisfies the DOR Guideline requirements of Section 4.2.1.

Equipment submergence has also been addressed where the possibility exists that flooding of equipment may result from high energy line breaks (HELB).

3.3 TEMPERATURE, PRESSURE, AND HUMIDITY CONDITIONS INSIDE CONTAINMENT

The licensee has provided the results of accident analyses as follows:

	Max. Temp. (°F)	Max. Press. (psig)	Humidity
LOCA	286	60	100%
MSLB	(not provided)		

The staff has concluded that the minimum temperature profile for equipment qualification purposes should include a margin to account for higher than average temperatures in the upper regions of the containment that can exist due to stratification especially following a postulated MSLB. Use of the steam saturation temperature corresponding to the total building pressure (partial pressure of steam plus partial pressure of air) versus time until the sprays become effective will provide an acceptable margin for either a postulated LOCA or MSLB, whichever is controlling as to potential adverse environmental effects on equipment.

The licensee's specified temperature (service condition) of 286°F does not satisfy the above requirement. A saturation temperature corresponding to the pressure profile (307°F peak temperature at 60 psig) should be used instead. The licensee should update his equipment summary tables to reflect this change. If there is any equipment that does not meet the staff position, the licensee must provide either justification that the equipment will perform its intended function under the specified conditions or propose corrective action.

3.4 TEMPERATURE, PRESSURE AND HUMIDITY CONDITIONS OUTSIDE CONTAINMENT

The licensee has provided the temperature pressure, humidity and applicable environmental values associated with a HELB outside containment in the following plant areas:

1. Auxiliary Building
2. Intermediate building and cable tunnel
3. Diesel generator rooms
4. Screen house
5. Auxiliary building addition
6. Turbine building
7. Relay and battery rooms
8. Mechanical equipment room
9. Control room

The staff has verified that the parameters identified by the licensee for the MSLB are acceptable.

3.5 SUBMERGENCE

The maximum submergence levels have been established and assessed by the licensee. The staff assumed for this review, unless otherwise noted, that the methodology employed by the licensee is in accordance with the appropriate criteria as established by the Commission Memorandum and Order (CLI-80-21), dated May 23, 1980. The licensee's value for maximum submergence is 7 feet. The elevation level was not stated. The licensee should provide this information.

The licensee should provide an assessment of the failure modes associated with the submergence of equipment. Assurance should also be provided that the subsequent failure of this equipment will not adversely affect any other safety functions or mislead an operator. Additionally, the

licensee should discuss operating time, across the spectrum of events, in relation to the time of submergence. If the results of the licensee's assessment are acceptable, then the equipment may be exempt from the submergence parameter of qualification.

3.6 CHEMICAL SPRAY

The licensee's FSAR value for the chemical concentration is 2000-3000 PPM boric acid solution. The exact volume percent used by the vendors for qualification testing should be verified by the licensee. Therefore for the purpose of this review, the effects of chemical spray will be considered unresolved.

3.7 AGING

The DOR Guidelines, section 7, does not require a qualified life to be established for all safety related electrical equipment, however, the following actions are required:

1. Detailed comparison of existing equipment to the materials identifed in Appendix C of the DOR guidelines. The first supplement to IEB-79-01B requires the licensees to utilize the table and identify any additional materials as a result of their effort.
2. Establish an ongoing program to review surveillance and maintenance records to identify potential age related degradations.
3. Establish component maintenance and replacement schedules which include considerations of aging characteristics of the installed components.

For this review the staff requires that the licensee submit supplemental information to verify and identify their degree of conformance to the above requirements. The response should be inclusive of all the equipment identified as required to maintain their functional operability in harsh environments.

The staff will review the licensees response, when submitted, and report its evaluation in a supplemental report.

3.8 RADIATION (INSIDE AND OUTSIDE CONTAINMENT)

The licensee has provided values for radiation levels postulated to exist following a LOCA event. The application and methodology employed to determine these values have been presented to the licensee as part of the NRC staff criteria contained in the DOR Guidelines, NUREG-0588 and the guidance provided in IEB-79-01B, Supplement 2. Therefore, for this review, the staff has assumed that the values provided, unless otherwise noted, have been determined in accordance with the prescribed criteria. The staff's review assessed that the values to which equipment was qualified, enveloped the requirements identified by the licensee. The value established by the licensee is 1.6×10^{8} RADS for the integrated dose inside containment. This value envelopes the DOR Guidelines requirements and is therefore acceptable. A typical value outside containment of 2.8×10^{6} RADS has been used by the licensee to specify limiting radiation levels within the areas containing RHR and SI pumps in the auxiliary building. This value appears to consider the radiation levels influenced by the source term methodology associated with post-LOCA recirculation fluid lines and is therefore acceptable.

4.0 QUALIFICATION OF EQUIPMENT

The following subsections are the staff's assessment, based on the licensee's submittal, and the Franklin TER of the qualification status of safety-related electrical equipment.

The staff has separated the safety-related equipment into three categories (1) equipment requiring immediate corrective action, (2) equipment requiring additional qualification information and/or corrective action, and (3) equipment considered acceptable conditioned only on the satisfactory resolution of the staff's concern identified in Section 3.7.

The NRC staff in its assessment of the licensees submittal and the TER did not review the methodology employed to determine the values established by the licensee. However, in reviewing the TER a determination was made by the staff as to the stated conditions presented by the licensee. Additionally, the detailed review of supporting documentation referenced by the licensee (e.g., test reports) has been completed by FRC.

The environmental qualification data bank to be established by the staff will provide the means to cross reference each supporting document to the referencing licensee.

Where supporting documents were found to be unacceptable, the licensee will be required to take additional corrective actions to either establish qualification or replace the item(s) of concern. An appendix for each subsection is attached which provides a list of equipment which requires additional information and/or corrective action. Where appropriate, a reference is provided in the appendices to identify deficiencies. It should be noted, as in the Commission Memorandum and Order, that the deficiencies identified do not necessarily mean that equipment is unqualified. However, they are cause for concern and may require further case-by-case evaluations.

4.1 EQUIPMENT REQUIRING IMMEDIATE CORRECTIVE ACTION

Appendix A identifies equipment (if any) in this category. The licensee was requested to perform a review of the facilities safety-related electrical equipment. The licensees review of this equipment has not identified any equipment requiring immediate corrective action and therefore no licensee event reports were submitted. In addition the staff, in this review, has not identified any safety-related electrical equipment which is known not to be able to perform its intended safety function during the time period in which it is required to operate.

4.2 EQUIPMENT REQUIRING ADDITIONAL INFORMATION AND/OR CORRECTIVE ACTION

Appendix B identifies equipment in this category, including the tabulation of their deficiencies. The deficiencies are noted by a letter relating to the legend, identified below, indicating that insufficient information has been provided for the qualification parameter or condition.

R - Radiation

T - Temperature

QT - Qualification Time

RT - Required Time

P - Pressure

H - Humidity

CS - Chemical Spray

A - Material Aging Evaluation, Replacement Schedule, Ongoing Equipment Surveillance

S - Submergence

M - Margin

I - HELB Evaluation Outside Containment Not Completed

QM - Qualification Method

RPN - Equipment Relocation or Replacement, Adequate Schedule Not Provided

EXN - Exempted Equipment Justification Inadequate

SEN - Separate Effects Qualification Justification Inadequate

QI - Qualification Information Being Developed

RPS - Equipment Relocation or Replacement Schedule Provided.

As noted in Section 4.0, these deficiencies do not necessarily mean that the equipment is unqualified. However, they are cause for concern and require further case-by-case evaluations. The staff has determined that an acceptable basis to exempt equipment from qualification, in whole or part, can be established provided the following can be established and verified by the licensees:

(1) Equipment does not provide essential safety functions in the harsh environment and failure of it in the harsh environment will not impact safety related functions or mislead an operator.

(2a) Equipment performs its function prior to its exposure to the harsh environment and the adequacy for the time margin provided is adequately justified, and

(2b) Subsequent failure of the equipment as a result of the harsh environment does not degrade other safety functions or mislead the operator.

(3) The safety-related function can be accomplished by some other designated equipment that has been adequately qualified and satisfies the single failure criteria.

(4) Equipment not subjected to a harsh environment as a result of the postulated accident.

The licensee is therefore required to supplement the information presented by providing their resolutions to the deficiencies identified which should include a description of the corrective action and schedules for its completion (as applicable), etc. The staff will review the licensees response, when submitted, and report on the resolution in a supplemental report.

It should be noted that where testing is presently being conducted, a condition may arise which results in a determination by the licensee that the equipment does not satisfy the qualification test requirements. For that equipment the licensee will be required to provide their proposed corrective action, on a timely basis, to assure that qualification can be established by June 30, 1982.

4.3 EQUIPMENT CONSIDERED ACCEPTABLE OR CONDITIONALLY ACCEPTABLE

Based on the staffs review of the licensees submittal and the TER the staff identified the equipment in Appendix C (1) as acceptable on the basis that the qualification program adequately enveloped the specific environmental plant parameters, or (2) conditionally acceptable subject to the satisfactory resolution of the staff concern identified in Section 3.7.

For the equipment identified as conditionally acceptable the staff determined that the licensee did not clearly:

(1) state that a material evaluation on their equipment was conducted to assure that no known materials susceptible to degradation due to aging have been used in their equipment.

(2) establish an ongoing program to review the surveillance and maintenance records of their plant in order to identify equipment degradation which may be age related, and/or

(3) propose a maintenance program and replacement schedule for equipment identified in item 1 or equipment that is qualified for less than the life of the plant.

The licensee is therefore required to supplement the information presented for equipment in this category before full acceptance of this equipment can be established. The staff will review the licensees response, when submitted, and report on the resolution in a supplemental report.

5.0 DEFERRED REQUIREMENTS

IE Bulletin 79-01B, Supplement 3 has relaxed the time constraints for the submission of the information associated with cold shutdown equipment and TMI Lessons Learned modifications. To permit a uniform program schedule the SEP plant reviews have been amended. The staff required that this information be provided by February 1, 1981. The staff will provide a supplemental evaluation addressing these concerns.

APPENDIX B

List of Equipment in Section 4.2, Equipment Requiring

Additional Information And/Or Corrective Action

NOTE: (R) Licensee has committed to replace equipment

LEGEND:
DESIGNATION FOR Deficiency

R - Radiation
T - Temperature
QT - Qualification Time
RT - Required Time
P - Pressure
H - Humidity
CS - Chemical Spray
A - Material Aging Evaluation, Replacement Schedule, Ongoing Equipment Surveillance
S - Submergence
M - Margin
I - HELB Evaluation Outside Containment Not Completed
QM - Qualification Method
RPN - Equipment Relocation or Replacement, Adequate Schedule Not Provided
EXN - Exempted Equipment Justification Inadequate
SEN - Separate Effects Qualification Justification Inadequate
QI - Qualification Information Being Developed
RPS - Equipment Relocation or Replacement Schedule Provided

TER Item No.	Equipment Description	Manufacturer	Model/ Type	Deficiencies
(R) 1A	SOV Operator	ASCO	LB 8300 B6IU	QI,QM,A,T,P,QT
(R) 1B	SOV Operator	ASCO	LB 8300 B64RU	QI,QM,A,T,P,QT
1C	SOV Operator	ASCO	LBX831616	QI,QM,A,T,QT
15A	Cables	Kerite	Type HT	A,R
15B	Cables	Kerite	Type HT	A,R
16A	Cables	Coleman	UNK	A,R
17A	Cables	Coleman	UNK	A,R
17B	Cables	Rome	UNK	A,R
17C	Cables	General Cable	UNK	A,R
(R)19	Level transmitter	Barton	289	QI,A

TER Item No.	Equipment Description	Manufacturer	Model/ Type	Deficiency
21A	Pressure transmitter	Barton	332	QI,A
30	Motor	Westinghouse	588.5-CSP	QI,QM,A,T,CS,R,
34	Splice	Raychem	Type WCSF-N	R
3A	Solenoid	Lawrence	110114W	QI,QM,A,T,P,QT
3B	Solenoid	Lawrence	125434W	QI,QM,A,T,P,QT
(R) 4	Solenoid	Versa	VSG	QI,QM,A,T,P,QT
(R) 6A	Solenoid	Versa	VSG-3731	QI,A,QM,T,P,QT, CS,R
(R) 6B	Solenoid	Versa	VSG-3421	QI,A,QM,T,P,QT, CS,R
11	Motor	Westinghouse	505USABDP	QI
13B	Electrical Penetration	Westinghouse	UNK	A,QM,R
14	Terminal Block	Westinghoue	542247	A,S,CS,R
(R) 20	Flow transmitter	Barton	332	QI
(R) 21B	Pressure transmitter	Barton	332	QI
(R) 22	Pressure transmitter	Foxboro	611-GM-DSI	A,S,CS,R,QM
(R) 24	Level transmitter	Foxboro	(Modified) 613-M-MDL	A,S,CS,R,QM
(R) 26	Level transmitter	Foxboro	613-HM-HSI	QI
(R) 27	Temperature Detector Elements	Rosemount	176JA	QI,A,QM,T,P,QT,R

TER Item No.	Equipment Description	Manufacturer	Model/ Type	Deficiency
31	Switchgear	Westinghouse	DB-50A, 1600A	QI,A,QM,T
35	Solenoid	Valcor	V57300	QI,QM,A,T,P,QT,CS, R
41	Switchgear	Westinghouse	DH-350E, 1200A	QI,A,QM,T

APPENDIX C

List of Equipment in Section 4.3,
Equipment Considered Acceptable or Conditionally Acceptable

TER ITEM NO.	Equipment Description	Manufacturer	Model/ Type	Deficiencies
13A	Electrical Penetrations	Crouse-Hinds	UNK	
8E	MOV	LIMITORQUE	SMB-00	A
(R) 18	Level Transmitters	Foxboro	611-GM-ASI	A
(R) 23	Pressure Transmitter	Foxboro	611-GM-DSI	A
25	Level Transmitter	Foxboro	613-DM-MSI	A
8B	MOV	LIMITORQUE	SMB-00	A
8D	MOV	LIMITORQUE	SMB-00	A
8H	MOV	LIMITORQUE	SMB-1	A
15C	Cable	Kerite	Type HT	A
5A	SOV Operator	ASCO	UNK	
7	Damper	UNK	UNK	
8A	MOV	LIMITORQUE	SMB-2	
8F	MOV	LIMITORQUE	SMB-00	
8G	MOV	LIMITORQUE	SMB-00	

Appendix D

Plant Safety-Related Systems
and Display Instrumentation

A. Safe Shutdown Systems

System	Term	Function
Reactor Protection/Trip System*	S	Trips reactor when predetermined set points are exceeded
Main Steam (MSIVs, Safeties, Atmospheric Reliefs)*	I	Releases energy (steam) for plant cooldown/isolates MS during MSLB/ HELB accidents
Auxiliary Feedwater*/Standby Auxiliary	I/L	Provides steam gen. makeup water for decay heat removal & plant cooldown
Chemical & Volume Control (Charging Portions)*	L	Provides reactor makeup water during cooldown/long term chemical control
Residual Heat Removal+	L	Long term heat removal capability
Component Cooling	L	Removes heat from RHR heat exchanger/ transfers heat to the service sys.
Service Water	L	Transfers heat from the component cooling heat exc. to heat sink
Diesel Generator*	S/I	Emergency electrical power source for vital equipment
125-V dc Power Supply System*	L	Backup power to vital equip. & circuits
Diesel Oil*	S/I	Lubrication for emerg. diesels
Vital Instrument Power Supply*	L	Self explanatory
Auxiliary Power Distribution System	L	Power to various elec. equipment
Primary Auxiliary Building Ventilation System**	I/L	Self explanatory
Control Building H.V.C. Systems**	I/L	Self explanatory
Diesel Room Ventilation Systems**	I	Self explanatory

Plant Safety-Related Systems
and Display Instrumentation

B. Accident Mitigating Systems (LOCA, MSLB, FWLB)

System	Term	Function
Pressurizer Pressure Relief	I	Power operated relief valves for relieving RCS pressure.
Containment Isolation System*	L	Isolates containment penetrations in case of accident
Reactor Containment Fan Coolers, Hydrogen Purge and Hydrogen Recombiners	I	Post LOCA containment heat removal & hydrogen control
Safety Injection and Accumulators	S/I	Provides cooling water to the core post-accident
Post-Accident Sampling & Monitoring Containment Radiation Monitor	L	Self explanatory
Containment Spray	I	Post accident containment pressure & iodine control
Feedwater Control & Bypass Valves/ Feedpump trip/Feedpump Discharge Valves	S	Isolates feedwater lines in case of line break
Pump Room Ventilation coolers (RHR/SI/ I/L/CS/CCP)	I/L	Cooling for motor of certain vital pumps
Control Room Ventilation	L	Redundant, vital vent sys.
Main Steam Isolation valves	S	Automatically isolates the main steam lines in case of line break

LEGEND:

*Systems which function both for safe shutdown and also for accident mitigation.
**Review of these systems deferred until after February 1, 1981, as referenced in Section 2.2.2. of TER.
+System required for cold shutdown only.

(S) Short Term — Less than 24 hours
(I) Intermediate Term — Up to 30 days
(L) Long Term — 30 days plus

C. Accident Mitigating and Safety Shutdown Instruments (LOCA, MSLB, FWLB)

	TERM
Pressurizer Level	I
Pressurizer Pressure	L
RCS Temperature	L
Containment Pressure***	I
Steam Line Pressure	L
Steam Line Flow	S
Safety Injection Flow***	I
Sump level***	L
Steam generator Level	L
Auxiliary Feed System Flow	L
Chemical and volume control flow	I
RWST Level	I
BAST Level***	S
Residual Heat Removal Flow	L
Component Cooling Water Flow	L
Service Water System	L
Diesel Generator	I
Emergency AC Power	L
Emergency DC Power	L

***Instruments required only for accident mitigation purposes.