Commonwealth Edison Company
1400 Opus Place
Downers Grove, IL 60515

ComEd

May 24, 1995

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attn: Document Control Desk

Subject: Quad Cities Nuclear Station Units 1 and 2,
Additional Information - Core Shroud Modification
NRC Docket Nos. 50-254 and 50-265

Reference:
(1) R.M. Pulsifer to D.L. Farrar letter dated March 3, 1995.

(2) J.L. Schrage to USNRC letters dated March 3, 1995, March 22, 1995, March 27, 1995, April 6, 1995, May 5, 1995, May 8, 1995, May 11, 1995, and May 12, 1995.

(3) Teleconference between USNRC (R. Pulsifer, et al) and ComEd (J. Schrage, et al) on May 16, 1995.

In Reference (1), the NRC staff transmitted a Request for Additional Information (RAI) to Commonwealth Edison (ComEd) related to the proposed repair and inspection plan for the Quad Cities Station, Units 1 and 2 core shrouds. ComEd provided a response to the RAI (including additional NRC staff-requested clarifications) in the Reference (2) letters. During the Reference (3) teleconference, the NRC Staff requested additional information pertaining to the proposed Quad Cities Station core shroud repair.

Enclosure 1 to this letter (including the associated Attachments A and B), transmits the information requested during the Reference (3) teleconference.

This submittal contains information which is proprietary in nature to the General Electric Nuclear Company. This proprietary information is contained in the Attachment B of the Enclosure, and is marked by vertical lines in the right hand margin. ComEd has included, as Enclosure 2, a General Electric Nuclear Company affidavits (dated May 19, 1995), per the requirements of 10CFR 2.790(b), explaining the reasons and circumstances for withholding the applicable information from public disclosure.

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To the best of my knowledge and belief, the analyses and evaluations contained in these documents are true and correct. In some respects these documents are not based on my personal knowledge, but on information furnished by other Commonwealth Edison employees, contractor employees, and/or consultants. Such information has been reviewed in accordance with company practice, and I believe it to be reliable.

If there are any questions concerning this matter, or need for further clarification, please contact this office.

Sincerely,

John L. Schrage
Nuclear Licensing Administrator

OFFICIAL SEAL
MARY JO YACK
NOTARY PUBLIC, STATE OF ILLINOIS
MY COMMISSION EXPIRES 11/29/97

Mary Jo Yack 5-24-95

Enclosure 1 ComEd Response to Request for Additional Information

Attachment A Fluence Estimates at Shroud Welds
Attachment B Comparison Summary of Shroud Weights Used

Enclosure 2 Quad Cities Station Unit 2 Core shroud repair document - General Electric Nuclear Company Affidavit, dated May 19, 1995.

cc: J. Martin, Regional Administrator - RIII
R. Pulsifer, Project Manager - NRR
C. Miller, Senior Resident Inspector - Quad Cities
Office of Nuclear Facility Safety - IDNS

Enclosure 2

Quad Cities Station Unit 2
Selected Core Shroud Repair Design Documents

GENERAL ELECTRIC COMPANY AFFIDAVIT

General Electric Company

AFFIDAVIT

I, David J. Robare, being duly sworn, depose and state as follows:

(1) I am Project Manager, Plant Licensing/Renewal Projects, General Electric Company ("GE") and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in the GE proprietary report, GENE /ComEd Responses to the NRC Request for Additional Information Regarding the Quad Cities Units 1 and 2 Shroud Repair Project, Quad Cities Shroud Weights Summary, (GE Company Proprietary Information), dated May 18, 1995. The proprietary information is delineated by bars marked in the margin adjacent to the specific material.

(3) In making this application for withholding of proprietary information of which it is the owner, GE relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), 2.790(a)(4), and 2.790(d)(1) for "trade secrets and commercial or financial information obtained from a person and privileged or confidential" (Exemption 4). The material for which exemption from disclosure is here sought is all "confidential commercial information", and some portions also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by General Electric's competitors without license from General Electric constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information which reveals cost or price information, production capacities, budget levels, or commercial strategies of General Electric, its customers, or its suppliers;

d. Information which reveals aspects of past, present, or future General Electric customer-funded development plans and programs, of potential commercial value to General Electric;

e. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in both paragraphs (4)a. and (4)b., above.

(5) The information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GE, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GE, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge. Access to such documents within GE is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GE are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it contains detailed results of analytical models, methods and processes, including computer codes, and it contains the supporting Design Record File (DRF) detailed calculations, results and bases for conclusions. These reports are part of the DRF supporting information to evaluate a hardware design modification (stabilizer

for the shroud horizontal welds) intended to be installed in a reactor to resolve the reactor pressure vessel core shroud weld cracking concern. This detailed level of information usually resides in GENE files, only for audit by customers and the NRC. This information shows in specific detail the processes, codes and methods employed to perform the evaluations summarized in the above identified document. The development and approval of this design modification utilized systems, components, and models and computer codes that were developed at a significant cost to GE, on the order of several hundred thousand dollars.

Development of the supporting processes, as shown in part in this DRF detailed information, was at a significant additional cost to GE, in excess of a million dollars, over and above the large cost of developing the underlying individual proprietary report information.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GE's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GE's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GE.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GE's competitive advantage will be lost if its competitors are able to use the results of the GE experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GE would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GE of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

STATE OF CALIFORNIA)
) ss:
COUNTY OF SANTA CLARA)

David J. Robare, being duly sworn, deposes and says:

That he has read the foregoing affidavit and the matters stated therein are true and correct to the best of his knowledge, information, and belief.

Executed at San Jose, California, this 19TH day of MAY 1995 ~~1993~~.

David J. Robare
General Electric Company

Subscribed and sworn before me this 19th day of May 1995.

MARY L. KENDALL
COMM. # 987864
Notary Public — California
SANTA CLARA COUNTY
My Comm. Expires MAR 26, 1997

Mary L. Kendall
Notary Public, State of California

Enclosure 1

ComEd Response to Request for Additional Information

Request For Additional Information
Quad Cities Core Shroud Modification

Power Uprate

The core shroud modification design utilizes the current design bases for the plant. ComEd presently does not have any plans, or foresee any plans, for power uprate requests at the Quad Cities Station. The core shroud hardware design abilities would need to be re-evaluated for any power uprate change to the current design bases. This would be one of many plant components that would need to be re-evaluated if a power uprate was ever requested.

Fluence Estimates at Shroud Welds

The estimated fast neutron flux and fluence at the core shroud horizontal welds for Quad Cities and Dresden Stations was evaluated and is provided in Attachment A of this submittal. The document provided is section 9.0 of a ComEd report, "Core shroud Engineering Evaluation Report, Dresden Unit 3 & Quad Cities Unit 1, Revision 0".

Reinspection Plan of the Core Shroud Hardware

ComEd will submit the Quad Cities Unit 2 core shroud hardware "Reinspection Plan" by March 15, 1996. This schedule is approximately nine months following restart of Quad Cities Unit 2. This schedule incorporates the concurrent activities necessary to complete the core shroud repair on Dresden Unit 2 (during D2R14, scheduled to begin in June 1995) and prepare for the implementation of the core shroud repair on Quad Cities Unit 1 (during Q1R14, scheduled to begin in February 1996).

Air Cooling of XM-19

ComEd will submit further information supporting the use of air-cooled XM-19 (versus water-quenched) by September 25, 1995. If additional information is required, ComEd will submit a plan to conduct further stress corrosion testing of the material by September 25, 1995.

Comparison Summary of Shroud Weights Used

A comparison summary of shroud weights used in report numbers GENE 771-67-1094, GENE 771-68-1094 and supplement "A" to GENE 771-68-1094 are provided in Attachment B of this submittal.

Stress in the Jet Pump Support Plate (Shroud Support Plate) Due to Shrinkage During the Thermal Upset Case

ComEd performed an evaluation to demonstrate that the stress in the shroud support plate and the shroud support plate to reactor pressure vessel weld (weld H9) for the thermal upset case with H8 cracked and 0.125 inch thermal contraction in the shroud support legs is bounded by the previous analysis GENE 771-67-1094. This evaluation is provided in Attachment C of this submittal.

Creep Relaxation Due to Radiation on the Tie Rod Bolts

The estimated maximum 40-year radiation exposure of the shroud repair is less than 1.0 E+18 n/cm-cm and is below the threshold at which there would be any stress relaxation in the repair hardware due to radiation of >1.0E+19 n/cm-cm.

The stress in the shroud repair hardware during normal operation are low enough that there will be no thermal stress relaxation. For example, the stress in the tie rod during normal operation is approximately 11.6 ksi, while the yield stress for the tie rod is 29.45 ksi. Due to the short duration of the higher upset, emergency and faulted load, there will be no thermal stress relaxation during these events.

SWARF Collection During Installation

The Swarf system is a collection and removal system to capture the byproducts from the Electric Discharge Machining (EDM) operation. The Swarf must be removed or it will build up and prevent the EDM process from working. The byproduct of the EDM are gases and the metallic residue called swarf. Ninety (90)% of the swarf is 5 micron or less in size.

The EDM process was qualified by General Electric for the material which was being machined. Previously, other utilities have generated over 300 filters for a shroud repair EDM process. Based on the material being removed and the volumes required for removal, we estimated there would be approximately 154 pounds of swarf generated. The swarf canisters were designed to prevent the generation of hundreds of filters. During the qualification of the EDM process, the swarf removal system recovered all but approximately 10% of the material removed in the test burn conditions. The 10% was a conservative estimate due to the collection methods and weighing methods employed.

These test burns were qualified in a pressure tank to simulate the process at depth. Quad Cities Station did not want the remaining 10% discharged to the skimmer surge tank as we are concerned about source term reduction, premature plugging of the fuel

pool heat exchanger, or crud build up in the fuel pool cooling system. The decision to run the discharge to the 260 Tri-Nuc vacuum was agreed to by all parties. The Tri-Nuc was equipped with 1 micron filters for the EDM process. The Tri-Nuc filters are changed when the differential pressure on the filter reaches the vacuum limits. During the EDM process we were changing filters approximately every hour. Upon investigation of the filters it was noted that the filters were not plugged due to swarf. The filters were plugging apparently due to water impurities.

The swarf process begins with an EDM actuator. This actuator is equipped with a graphite electrode. This electrode has water passages drilled through the electrode. The holes are sized for maximum burning efficiency. Too large of a hole allows too much water to pass through the burning point. Too small of a hole prevents a proper burn by creating swarf build up and promotes uneven electrode wear. The swarf is then carried to the swarf collector which is approximately 90% efficient for swarf collection. The discharge of the swarf collector is the suction for the swarf pump. The discharge of the swarf pump connects to the gas separator. The discharge of the gas separator connects to the Tri-Nuc 260 vacuum. The swarf pumps are 6 gpm. pumps. The vacuum operates at 260 gpm. However, there is a check valve on the gas separator to prevent cavitation and increased flow through the separator which would minimize the separator efficiency.

The lower burns through the jet pump are done with two cylindrical electrodes which rotate and index in at the same time. This produces a very even burn. This burn creates a captured burn area, which minimizes the amount of swarf which would not be collected during the burn process. The water clarity is not an issue as the swarf which is not collected deposits in the jet pump deck plate in the localized area. The swarf which was not collected by the swarf process will be vacuumed up to the extent possible after the repair is completed.

The upper electrodes are blocks. Two burns for each notch are required. The notch is square, so the block can only index into the flange. The rough burn creates a very rough opening and creates tips where the swarf holes in the electrode blocks are located. The finish blocks produce the notches to dimension and remove any of the tips from the rough burn. The finish blocks do not use swarf collection, on the leading face, as this would allow more tips to be created. The blocks are not a captured burn. The sides of the burn and top of the electrode are exposed. This allows some of the gasses and swarf to not be collected. The upper process is the main contributor to water clarity problems experienced in the vessel during the EDM process. The swarf which was not collected by the swarf process will be vacuumed up to the extent possible after the repair and inspections are complete during the general area inspection and cleaning efforts.

Loose Part Monitoring.

Quad Cities does not have a loose-parts monitoring system. The core shroud hardware is designed with all pieces of the stabilizer assemblies locked in place with mechanical devices. Hence loose parts are not anticipated. The core shroud hardware will be inspected in accordance with the "Reinspection Plan" which will be submitted by March 15, 1996.

In the remote possibility that a part of the hardware does become loose, it would fall and rest on the jet pump support plate. The possibility of a loose part reaching the reactor fuel is even more remote. If fretting of the fuel clad did occur due to a small loose part/piece (i.e. 1/2 inch in diameter or less), the Off Gas Radiation Monitors would detect the increase in fission product release (radiation). The Quad Cities Technical Specifications delineate the instrumentation requirements for these monitors. Station operating procedures provide required actions when these monitors indicate elevated release rates, in order to minimize the release of fission products.

The Main Steam Line Radiation Monitors are designed to detect large changes in fission product release (gross fuel failure), and provide automatic protective functions to minimize the release of fission products. This protective function will actuate when a predetermined and preset radiation level in the main steam is reached. The Quad Cities Technical Specifications delineate the instrumentation requirements and setpoint for these monitors. When the setpoint is reached, an automatic action is initiated to close the main steam line isolation valves and SCRAM the reactor.

Attachment A

Fluence Estimates at Shroud Welds

9.0 FLUENCE ESTIMATES AT SHROUD WELDS

Representative fast neutron fluence estimates have been established for welds H1 through H7 at Dresden Unit 2 and Unit 3, and Quad Cities Unit 1 and Unit 2. See Table 9.1 for details. Estimates were based upon three primary assumptions:

- The peak neutron flux at the shroud beltline is 3.5×10^{11} n/sec-cm^2. This value represents a value based on computed flux information from Chin-Shan Unit 1.

- Axial flux variations calculated for Peach Bottom Unit 2 are reasonably representative of variations anticipated for the Dresden and Quad Cities units. This assumption was needed because the flux calculations performed at Chin Shan did not extend to weld elevations of interest.

- Operating time is assumed to be equivalent to effective full power years of operation to the end of 1993 (13.36 EFPY).

The size and configuration of the shroud for Dresden, Quad Cities and Peach Bottom plants are similar; however, the ComEd plants have fewer fuel assemblies than does Peach Bottom Unit 2 (724 versus 764). In addition, there is a larger gap between the core edge and the shrouds at Dresden and Quad Cities such that lower neutron flux will be seen by the shroud surface. As a result the flux estimation at the shroud was (beltline elevation) is better represented by the results estimated for Chin-Shan Unit 1. The large moderator gap at the Chin-Shan plant is similar to the ComEd plants and is a better estimator of fast neutron flux.

The assumptions listed above establish a generic flux generation pattern both axially and radially. The magnitude of the neutron flux at each weld is further approximated by taking the product of relative flux ratio times the estimated peak flux at the shroud beltline surface. The estimated fluences at shroud welds for Units 2 and 3 at Dresden Station, and Units 1 and 2 at Quad Cities Station are given in Table 9.1.

Accumulated fluence is relatively low for all of the welds in both of the Dresden and both of the Quad Cities Units. Irradiation assisted stress corrosion cracking (IASCC) is unlikely to be a factor in shroud cracking at any of the welds, because the threshold for IASCC in non-furnace sensitized austenitic stainless steel is about 5×10^{20} n/cm^2, and the fluence estimates for all of the shroud horizontal welds are significantly less than this threshold. For example, the most extensive cracking in the core shroud was identified at the H5 weld, and fluence for this weld is estimated to be more than four orders of magnitude less than the threshold fluence for IASCC.

Table 9.1
Estimated Fast Neutron Flux and Fluence
Core Shroud Horizontal Welds

Dresden and Quad Cities Station

Weld	Flux (n/sec-cm^2)	Fluence (n/cm^2)*
H1	1.9×10^9	8.0×10^{17}
H2	1.3×10^{10}	5.0×10^{18}
H3	1.6×10^{11}	7.0×10^{19}
H4	3.3×10^{11}	1.4×10^{20}
H5	6.3×10^7	3.0×10^{16}
H6	2.8×10^7	1.0×10^{16}
H7	$<< 3.0 \times 10^5$	$<< 1.0 \times 10^{14}$

* Note: Based on 13.36 EFPY to 12/93