COMMONWEALTH EDISON COMPANY
Date: July 2, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In The Matter Of	)	
	)	
COMMONWEALTH EDISON COMPANY	)	Docket Nos. 50-454-OL
	)	50-455-OL
(Byron Nuclear Power Station,	)	
Units 1 & 2)	)	

SUMMARY OF THE TESTIMONY OF ROBERT V. LANEY ON CONTENTION 1 (WORK QUALITY)

I. Mr. Laney is a nuclear energy consultant with 35 years of experience in naval reactors, nuclear shipbuilding and commercial nuclear power plant construction.

II. The results of the Byron Reinspection Program confirm that Hatfield and Hunter construction work is of adequate quality. To reach this conclusion, it was necessary for Mr. Laney to go beyond the information contained in the Reinspection Report. He did the following:

A. Compared the work sample which was reinspected with the total of the Hatfield and Hunter safety-related work;

B. Reviewed the results of certain supplemental reinspections;

C. Assessed the discrepancy disposition decisions recorded in the Reinspection Report;

D. Examined the general scope of Edison's QA program at Byron;

E. Examined and viewed the types of discrepancies identified in the reinspection program and discussed their design significance with the responsible design engineers;

F. Evaluated the quality of contractor inspectors at Byron as revealed by the Reinspection Report; and

G. Discussed many of the above areas personally with responsible managers and engineers at the Byron site, at Edison headquarters and at Sargent and Lundy headquarters.

III. Mr. Laney concludes that the work quality of Hatfield and Hunter is adequate. The following reasons provide support for his conclusion:

A. The quality data gathered in the Reinspection Program and in follow up reinspections confirm work adequacy;

B. The Reinspection Program validates the competence of Hatfield and Hunter inspectors and this validation confirms work adequacy;

C. Engineering analyses of discrepancies found by the Reinspection Program shows that generous design margins make virtually all of them inconsequential; and

D. Edison's QA program is fundamentally sound, comprehensive and independent.

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TESTIMONY OF ROBERT V. LANEY

Q.1. Please state your name and business address.

A.1. My name is Robert V. Laney. My business address is 24 Trout Farm Lane, Duxbury, Massachusetts 02332.

Q.2. Please describe your educational and professional background.

A.2. I am a graduate of the U. S. Naval Academy. I hold a Masters degree in Marine Engineering from the Massachusetts Institute of Technology and an MBA from the University of Chicago. During and following World War II, I was on active Navy duty at sea and ashore. I was Engineering Officer on a carrier, destroyer and battleship.

From 1948 to 1960 I served under Admiral H. G. Rickover as Project Manager in the Naval Reactor Program and later as Technical Representative of the AEC and the Navy at the Westinghouse Bettis Atomic Power

Laboratory during the design and construction of various nuclear power plants for Naval vessels and the Shippingport nuclear power station.

While working in the Naval Reactors Program, I acquired extensive experience in designing and constructing naval nuclear power plants. This included construction and operation of a landbased submarine prototype power plant and the Shippingport nuclear power station.

While Naval Technical Representative at the Bettis Plant in Pittsburgh, I led the development of the first comprehensive quality assurance program for the industrial plants supplying critical reactor components for naval vessels.

In 1960 I became Nuclear Manager at the Quincy (Mass.) Shipyard of Bethlehem Steel Company where I was responsible for the construction and installation of nuclear plants in the nation's first two nuclear powered surface ships. After General Dynamics Corp. acquired the Quincy yard in 1964, I became Vice President and General Manager of the Quincy Division.

As General Manager, I was responsible for construction and delivery to the Navy of several nuclear powered

submarines. This required retraining shipyard personnel accustomed to constructing conventional commercial ships to build nuclear submarines to the most exacting standards of quality.

In 1970 I joined the Argonne National Laboratory, operated by the University of Chicago, as Associate Director responsible for nuclear reactor research and development. I later became Deputy Director, with responsibility for all applied energy research and development and for the operation of Argonne's several research reactors.

Since leaving Argonne in 1979, I have been an independent consultant in the nuclear energy field.

Q.3. Would you please describe your professional experience since leaving the Argonne National Laboratory?

A.3. I have:

a) Served on a senior advisory Panel, reporting to the Chairman of the Board of the Commonwealth Edison Company, whose mission was to assess the adequacy of the Company's initiatives taken as a result of the accident at Three Mile Island.

b) Served as member of an Advisory Committee to the Chief Executive Officer of the General Public Utili-

ties Corporation, whose mission was to evaluate two particular areas of concern after TMI: (1) personnel selection and training, and (2) man/machine interface and communications problems.

c) Formed and served as Chairman of a review team whose purpose was to improve engineering support for the nuclear construction program of the Washington Public Power Supply System (WPPSS).

d) Served as consultant to Houston Power and Lighting Company to evaluate their Engineering Quality Assurance Program for the South Texas Nuclear Station.

e) Formed and served as Chairman of a Panel which audited the Washington Public Power Supply System's program to verify the design and construction of their WNP-2 nuclear station.

f) Served as member of a special study group formed to advise the Nuclear Regulatory Commission on means to improve the quality of construction of commercial nuclear power plants.

g) Assisted Admiral Rickover in preparing an assessment of GPU Nuclear Corporation's management capability to operate TME-1.

A copy of my resume is attached to this testimony as Attachment A.

Q.4. What is the relevance of your experience to evaluating the adequacy of the Byron Reinspection Program as a means of validating the quality of construction work performed by Hatfield and Hunter?

A.4. My nuclear experience of thirty-five years in naval reactors, nuclear shipbuilding, and commercial nuclear power plant consulting has frequently required me to be intimately involved with means of achieving and confirming high standards of construction quality. The history of nuclear construction since about 1950, both naval and commercial, has been marked by a succession of quality-raising events, sometimes initiated by technical advances and sometimes by widely observed cases of quality deficiency. It is difficult for constructors and regulators alike to comprehend the significance of these changing quality standards, especially for construction projects spanning eight or more years. Only when looking back at earlier plants do we realize that sweeping improvements in standards and in work quality have taken place. This steady upward trend of required construction quality has occurred in both Naval and commercial plants. I have had the opportunity to participate in both.

My experience in Naval nuclear construction and as a consultant in commercial nuclear construction are both

relevant to evaluating the Byron reinspection program. Nuclear submarines require extremely high standards of quality for obvious reasons. Achieving such standards and assuring others that this has been done is no less vital in submarine than in commercial work. Although commercial nuclear plants and Naval nuclear plants differ in many ways, they do not differ in the underlying principles by which high quality is achieved. Experience in one is largely transferable to the other.

In addition to Navy experience, I recently completed a program of construction quality validation of a commercial nuclear power station nearing the end of construction. It was my responsibility, as leader of a small oversight team, to assist the Washington Public Power Supply System to plan and conduct a program to verify the adequacy of safety related construction work. This was achieved through a combination of hardware reinspections and document reviews. The oversight panel reviewed and approved the program, audited its performance, and provided independent evaluation of its results.

This quality verification program involved many of the same features as the Byron reinspection program --

sample selection, independent reinspection of hardware, analysis of results, sample expansion when data was inconclusive, etc. I, with other team members, was responsible for assuring that the program formulation was sound and that it was objectively conducted. In doing this I acquired familiarity with the difficulties of such an undertaking and with understanding and interpreting its results.

Q.5. What is the purpose of your testimony?

A.5. The purpose of my testimony is to show that the data accumulated in the Reinspection Program Report of February, 1984, as supplemented, provides substantial confirmation that Hatfield and Hunter construction work is of adequate quality.

Q.6. Are you familiar with the Byron Reinspection Program?

A.6. Yes. I reviewed and commented to Commonwealth Edison Company on early drafts of the program. I have read the Reinspection Report issued in February, 1984 and certain supplementary data. I had no part in performing the program other than the comments mentioned above, and no part in preparing the Report.

Q.7. What was the thrust of your comments on the earlier drafts?

A.7. I append hereto as Attachments B, C and D the three letters on this subject I wrote to Mr. L.O. Del George, Assistant Vice President, Commonwealth Edison, dated January 31, 1984; March 1, 1984; and March 12, 1984. These letters are the ones referred to in my previous answer.

These letters made two particular points. First, that the Reinspection Program Report of January 12, 1984, seemed adequate to confirm the qualification of inspectors, provided several areas which my letter described were covered more thoroughly. Second, that the program as then structured did not appear to be suitable to verify construction quality. This opinion was based on my doubts as to work sample scope in relation to total work performed.

An additional comment, contained in my March 1 letter, criticized the Februrary, 1984 report for its apparent failure to address the significance of inaccessible work. I later withdrew this comment, as explained in my March 12 letter, after I observed the information on inaccessible work in Appendix F of the Reinspection

Program Report. Pages F-7 through F-12, provided an adequate answer to this question.

Q.8. Since you did not participate in the Reinspection Program, what is the basis for your opinion on work quality?

A.8. Since the Reinspection Program was originally designed to test the competence of inspectors rather than directly to validate the quality of work, it was necessary for me to determine whether the substantial body of reinspection data obtained could be used for Hatfield and Hunter work validation. This involved going beyond the information contained in the report by comparing the work sample which was reinspected with the total of the Hatfield and Hunter safety-related work; reviewing the results of certain supplemental reinspections; assessing the discrepancy disposition decisions recorded in the Report; examining the general scope of the Commonwealth Edison Quality Assurance program at Byron; examining and viewing the types of discrepancies identified in the reinspection program and discussing their design significance with the responsible design engineers; evaluating the quality of contractor inspectors employed at Byron as revealed by the Reinspection Report; and discussing

many of these areas personally with one or more responsible managers or engineers at the Byron site, at Commonwealth Edison, and at Sargent and Lundy.

I applied my own experience and judgment to the information obtained.

Q.9. Do you have an opinion as to the quality of Hatfield and Hunter construction?

A.9. Yes. I believe that the work of these contractors is adequate.

Q.10. On what do you base this opinion?

A.10. I base this opinion on the following:

First, the body of quality data gathered in the Reinspection Program and in certain follow-up reinspections confirms work adequacy; Second, the Reinspection Program validates the competence of Hatfield and Hunter inspectors and this validation confirms work adequacy; Third, engineering analysis of discrepancies found by the Reinspection Program show that generous design margins make virtually all of them inconsequential. This fact gives me confidence that the portion of the work of Hatfield and Hunter that was not reinspected is adequate, even if discrepancies comparable to those uncovered in the reinspection program exist;

Fourth, a general familiarity with Commonwealth Edison's quality assurance programs and a knowledge of the evolution of quality program shows me that this program is fundamentally sound, comprehensive and independent.

Q.11. Would you expand on your reasons for believing that the Reinspection Program confirms the adequacy of H tfield and Hunter work?

A.11. Yes. The Reinspection Program was designed to test the competence of contractor's inspectors and not specifically to provide direct evidence onwork quality. Nevertheless the Program assembled in an organized way some 200,000 pieces of data related to work quality.

I have examined the usefulness of this data for informing us about Hatfield and Hunter work quality. I inquired into whether the work sample reinspected was sufficient to reasonably cover Hatfield and Hunter safety-related work. I assessed the adequacy of sample size in relation to all work performed by these contractors. I personally looked at the types of discrepancies which have been found, as well as the calculations made to assess their design importance.

Q. 12. How did you determine the adequacy of the reinspection program data for your evaluation of work quality.

A.12. I reviewed the data and found it divided into attributes and work elements. I use the term "attribute" to designate major segments of like work, such as "cable pan hangers," "cable terminations," etc. I use the term "work element" to identify inspectable features of attributes, such as "configuration," "location," "bolt size," etc.

For both Hatfield and Hunter I compared the attributes which were reinspected with the total of each contractor's attributes as shown in their work procedure index. For Hatfield, I found that nine out of the eleven attributes which could be reinspected were reinspected. The two which were accessible but not inspected were Cable Pan Covers, not yet installed, and Cable Pan Identification, a less significant attribute. Ten attributes were either inaccessible or not recreatable; among these were Material Receiving, Material Handling, Housekeeping, Embedded Conduct and Underground Duct Runs. In my opinion these ten attributes are, on the whole, less significant in size and importance than the nine which were reinspected. In addition, the embedded conduit and underground duct runs were installed using the same procedure as was

used for exposed conduit and duct runs, and exposed conduit and duct runs were reinspected. On this basis I believe that a representative and sufficient sample of Hatfield's work scope was reinspected to provide a basis for assessing work quality.

For Hunter, I found that eighteen out of twenty-one work elements (comprising the 3 Hunter attributes) which could be reinspected were reinspected. Fourteen work elements were not reinspected either because they were not recreatable or were inaccessible. I note that seven of the fourteen which could not be reinspected were welding in process inspection points such as preheat or welding interpass temperature. However, the Reinspection Program found Hunter's welding quality to be good, with less than a 3% discrepancy rate on 3725 welds and no design significant discrepancies. In my opinion, Hunter's favorable weld reinspection record reduces the importance of being able to reinspect these seven in process elements.

The Reinspection Program also reinspected Hunter's quality assurance documentation. I find that twenty-five out of thirty-three document elements were reinspected and found satisfactory.

Taking both hardware and document reinspection into account, I believe that a representative and sufficient sample of Hunter's total work scope sample was reinspected to provide a basis for assessing work quality. Even though sample scope is sufficient, I also inquired whether the sample size is large enough to justify a conclusion as to work quality.

Q.13. What was the sample size coverage of the reinspection program sample for Hatfield and Hunter?

A.13. Table III-3 on page III-7 of the Program Report shows that eleven percent of all Hatfield inspection-months were reinspected in the program and six percent of all Hunter inspection months were reinspected. From this it is reasonable to infer that, overall, some five to ten percent of the total work of these two contractors was reinspected. This is a significant sample size.

I believe that this sample gains additional value when one considers that it was selected by a random, one-in-five selection of inspectors, with no prior consideration of the kind of work each inspected. In other words, this was a randomly chosen work sample. Sample adequacy has now been further improved by (1) evaluating a group of highly stressed welds drawn from the body of discrepant cable tray connection

welds, 2) reinspecting and evaluating a group of highly stressed cable tray support welds which had been originally inspected by the ten Hatfield Weld inspectors who were not included in the Reinspection Program, and 3) performing additional inspections for certain Hatfield objective attributes where the sample sizes in the original program were not statistically significant. These additional evaluations and inspections are reported in the Supplement to the Reinspection Report. This present sample size is sufficient to be used to confirm the results of other more extensive inspection programs.

Q.14. Did you make any further evaluation of the data accumulated in the Reinspection Program.

A.14. I reviewed a number of the discrepancies which were identified in the Reinspection Program, giving particular attention to some of the worst Hatfield welds, and to the depth of engineering analysis which was used to assess their significance. Based on this personal assessment, I believe that these discrepant welds have no design significance. As a group, they exemplify the statement found in AWS A3.0-80 that "[a] discontinuity is not necessarily a defect" (See Rein-

spection Report, Appendix C, Exhibit C-2, page 2 of 15).

Q.15. What were the results of the Reinspection Program on which you relied?

A.15. The Reinspection Program data shows, for Hatfield, that of 87,783 inspections made, 3661 discrepancies were found. 1,251, or 34% of these were actually within design parameters and were not discrepant; 2,010 or 55% were of such a minor nature that they could be dispositioned as acceptable, based on engineering judgment. 400 or about 11% were analyzed by calculation to determine their significance. None of these Hatfield discrepancies had design significance and none reduced design margins below the level required by conservative design practice.

The Reinspection Program data shows, for Hunter, that of 73,349 inspections made, 793 discrepancies were found. 639, or about 81% of these were actually within design parameters and were not discrepant; 75, or 9% were of a minor nature and were dispositioned as acceptable, based on engineering judgment. 79 or 10% were analyzed by calculation to determine their significance. None of these Hunter discrepancies had design significance and none reduced design margins

below the level required by conservative design practice. I conclude that the Reinspection Program gives inspection data on adequate and representative samples, randomly selected, of Hatfield and Hunter work. As a result, the data is significant and gives convincing confirmatory evidence of adequate work quality, supplementing other more extensive inspections.

Q.16. Would you explain your reason for believing that the Inspector Reinspection Program further attests to the adequacy of Hatfield and Hunter work?

A.16. Yes. The Inspector Reinspection Program was initiated to verify the reliability and effectiveness of Hatfield and Hunter inspectors after these contractors' certification and qualification practices had been questioned. The program was performed by reinspecting substantial samples of the work of twenty percent of the inspectors, selected by a random process. The reinpsections were performed by qualified and certified inspectors who had not previously inspected the work of the samples. Criteria were established by which to determine whether or not the reinspections confirmed the reliability of the original inspectors and inspections. In every case the reliability of the Hatfield and Hunter inspectors and

inspections was confirmed. The confirmation of the reliability of a randomly selected twenty percent of Hatfield and Hunter inspectors testifies to the reliability of all Hatfield and Hunter inspectors.

This confirmation of the reliability of the entire body of Hatfield and Hunter inspectors, whose reliability had previously been in question, adds further confidence that the work of these contractors embodies an acceptable level of quality. The presence of competent inspectors suggests that significant discrepancies are unlikely to go undetected. By removing doubt as to the qualification and capability of the whole body of inspectors, the Reinspection Program gives me confidence in the quality of the body of work which they inspected.

Q.17. Would you explain what you mean by "generous design margins" and how this bears on the adequacy of Hatfield and Hunter work?

A.17. Yes. When reviewing the Reinspection Program Report I observed that, whereas a substantial number of discrepancies were identified, no discrepancy was found to have any actual design significance. That is, no discrepancy reduced design margins below a level consistent with conservative design practice.

It may appear implausible to the Board that this forward and, I believe, are important to a full understanding of the Reinspection Program Report and its relevance to work quality.

Upon questioning why none of the discrepancies had design significance, I found two principal reasons. First, the process of design inherently introduces additional margins of conservatism beyond the normal margin which the designer intends. Second, the American Welding Society Structural Welding Code defines as discrepancies almost any deviation from a perfect weld, even though, as previously mentioned, the AWS states that discontinuities as defined in the code need not actually be defects. Both of these conditions, that is, additional margins and AWS Code adherence, are integral to the design and construction processes. These conditions lead inevitably to the identification of numerous construction "deviations from design" or "deviation from AWS Code" which are found, upon engineering analysis, to be acceptable.

A few examples from my review of Sargent and Lundy's design practice will illustrate this point and show how, in specific construction situations, deviations may be analyzed and found acceptable.

Cable and Pipe Sizing - Electric cable and pipe are purchased from available incremental ranges of sizes. The designer specifies the range within which his specific service need falls, thus probably calling for a cable or pipe size which has more capacity than required for the service. One use of the additional margin thus obtained could be to find certain kinds of construction discrepancies to be acceptable, if they should occur.

Conduit and Cable Tray Supports - Electric conduit supports are designed on the assumption that the conduit in service will be full of cable. Since conduits are usually not full, this assumption results in support structures haveing extra margin. As a result the designer may be able to accept a construction deviation in a specific case, after analysis.

Similarly, cable tray supports are designed on the assumption that all trays have a uniform cable load which is an assumed maximum load. However, are not loaded to maximum capacity. The result of the design assumption is that supports are designed with extra margins. In specific cases, the designer may use some of this extra margin as a basis for accepting construction deviations, without encroaching on normal

design margins. This would, of course, require a prior engineering analysis of the specific case.

AWS Welding Connections - The design process by which welded connections are designed for conduit and cable tray supports results in additional margins beyond the margin of approximately two which is inherent in the AWS Code. This additional margin is due to the use of standard connection details chosen from a group of incremental sizes, selected so that the bounding loads envelope the required design point. This will usually result in use of a connection having additional margin beyond the Code margin. Further design conservatism is introduced through the methods used to apply seismic loading and in the selection of material allowable stresses. The overall result of these conservative design processes is to introduce additional design margin which could be as much as fifty percent of design stress.

Under these circumstances, the design engineers would be able to show that certain construction deviations can be accepted without encroaching on normal design margins.

Numerous other examples of inherent design conservatism, in addition to these three, could be presented.

The point to be made is that a specific construction discrepancy may or may not be a deficiency requiring a hardware change. Engineering evaluation of the discrepancy may be required in order to find out.

Q.18. Please explain how the AWS code contributes to the identification of discrepancies which frequently have no design significance.

A.18. The AWS Code governs all welding on nuclear plants except the welding of pipe and pressure vessels which falls under the ASME Code. All of Hatfield's welds are AWS welds. According to the American Welding Society, aweld discrepancy is "An interruption of the typical structure of a weldment, such as lack of homogeneity in the mechanical, metallurgical or physical characteristics of the material or weldment. A discontinuity is not necessarily a defect." (See Answer to Question 14)

The Code identifies a series of discrepancies. Some of these do not reduce loadcarrying capacity and therefore have no design significance; other forms of discontinuity have potential design significance and, in a specific instance, may require analysis; a crack is always a basis for rejection of a weld.

All nuclear construction uses the AWS code. In doing so, the constructor undertakes to follow the code as to weld process and weld conformation and to inspect welds according to the Code specified discrepancies. This tends to identify significant numbers of discrepancies which, upon analysis, the designer may find he can accept as is.

Inherent design conservatism combined with meticulous definition of weld discrepancies, leads to generating reports of many discrepancies which are found to be, in fact, acceptable. Understanding this assists in interpreting the Reinspection Report and in using its results to assess work quality. The total absence of any design-significant discrepancies increases my confidence that the work of Hatfield and Hunter is adequate.

Q.19. Please describe your general familiarity with Commonwealth Edison's quality assurance program and how this provides a basis for your opinion on the adequacy of Hatfield and Hunter's work?

A.19. I have reviewed Commonwealth Edison's Report CE-1-A titled "Quality Assurance Program for Nuclear Generating Stations" Revision 28, dated March 16, 1984; and a statement by Mr. W. J. Shewski, Manager of Quality

Assurance for Commonwealth Edison, titled "Commonwealth Edison Company Quality Assurance Statement Regarding Verification of Adequacy of Design and Construction of Byron Nuclear Power Station Unit #1," revised April 2, 1984. The first of these two documents delineates mandatory requirements and actions which are required to assure that Commonwealth Edison's nuclear plants are designed, constructed, and operated to meet requirements of quality, reliability, and safety. Each of the eighteen Sections of the report addresses one of the eighteen Criteria listed in Appendix B to 10 CFR 50.

From my review of this document I believe that the Company's Quality Assurance Program is soundly constructed, organized so as to be independent of line construction management, and possesses the attributes necessary to effective performance. These include clear statements of line management's responsibilities for construction quality; adequate delegation of authority to Quality Assurance to identify quality problems and to verify implementation of solutions; and express delegation of authority to Quality Assurance to stop unsatisfactory work or further processing of unsatisfactory material. The second document describes how Commonwealth Edison has implemented

these general requirements and policies at the Byron Station. It provides detail on quality assurance organization, both headquarters and field; educational qualifications of quality assurance personnel; formal training provided; qualifications, certifications, and periodic recertifications; audit and surveillance scope and frequency; stop work authority and stop work actions; use of independent testing agencies; NRC and ASME surveys; Quality Assurance reports to management; INPO and other external evaluations; construction Quality Assurance staffing level; and site contractor self-audits and inspections.

In my opinion this document describes a comprehensive and adequate system of activities directed at assuring Byron construction quality. In thoroughness of coverage and in use of duplicative and diverse oversight groups, the Byron program attests to a management having high quality standards and expertise in the use of formal quality assurance methods.

I have reviewed testimony presented to this Board which indicates that the quality assurance processes of Commonwealth Edison and its construction contractors have not functioned satisfactorily in certain instances. Nevertheless, the structure, scope, and

independence of the Company's program are impressive, and add to my confidence that Hatfield and Hunter's construction work is of adequate quality.

Q.20. Would you sum up your opinion on the quality of Hatfield's and Hunter's work and your reasons

A.20. Yes. My conclusions are:

1. The Company's overall Quality Assurance organization and programs are well designed, comprehensive, and structurally independent, attesting to sound management attitudes towards quality.

2. The Company's inspector reinspection program validates the reliability of Hatfield and Hunter inspectors and inspections. It is worth noting that this reinspection program was begun to determine if contractor inspectors had performed reliably even though there may have been deficiencies in some of their qualification records. By confirming inspector reliability, the reinspection program also demonstrates the inherent effectiveness of the Company's extensive program of oversight and check inspections which are specifically intended to assure that contractor's inspectors maintain required inspection standards.

3. The reinspection program, including supplementary reinspections, produced a substantial body of quality data which is relevant to any assessment of Byron construction quality. In my opinion, this data, as it relates to Hatfield and Hunter, gives significant and convincing confirmatory evidence of adequate work quality.

4. Analysis of discrepancies which were found show that they have no design significance. This is due both to the minor character of the discrepancies and to conservatism inherent in design processes.

In summary, I observe at Byron an experienced owner, a sound quality program, and a conservative design. The reliability of Hatfield and Hunter inspectors, when challenged, is confirmed. More than 160,000 extra Hatfield and Hunter quality reinspections reveal no discrepancies of design significance. In my opinion these provide substantial bases for my conclusion that Hatfield and Hunter construction work is of adequate quality.

RESUME

ROBERT V. LANEY
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Phone: 617-585-8912

Robert V. Laney is a consultant in nuclear energy and energy project management. He has broad executive and technical experience in power plant operation, in energy research and development, in the construction and operation of large energy projects, and with the complexities of bringing new energy processes into practical use. His working experience includes extensive periods in operating power plants for the U.S. Navy, in the Navy nuclear reactor program, in the construction industry, in Government, and in energy research and development.

While an officer in the Navy, Mr. Laney was a member of a small group of engineers chosen by Admiral H. G. Rickover to assist him in developing nuclear power plants for naval ship propulsion. He served as Project Manager for the development, design, and construction of the land prototype of the Sea Wolf nuclear power plant. He participated in the construction of the first nuclear submarines, the U.S.S. Nautilus and Sea Wolf. These were followed by several other applications of nuclear power, including surface ships and the first utility-operated nuclear power station at Shippingport, Pennsylvania.

While Naval representative at the Bettis Laboratory, Mr. Laney led the development of the first comprehensive quality assurance program for the Navy's network at nuclear component suppliers.

From this work in developing a new energy technology for the Navy, Mr. Laney, as a civilian, moved into nuclear ship construction at the General Dynamics Shipyard in Quincy, Massachusetts. In 1963, he was appointed Vice-President and General Manager. In this capacity, he was responsible for the design and construction of a nuclear powered surface ships and submarines.

In 1970, he turned to the development of more advanced energy technologies when he was asked by the University of Chicago to become Associate Director of the Argonne National Laboratory, devoted to developing a range of new energy options. He was later appointed Deputy Director with additional responsibility for total Laboratory administration. During this period, he directed program for improved methods of coal combustion, conservation technologies, high-temperature high-efficiency batteries, nuclear fusion, and breeder reactors.

He retired from Argonne in 1979 to become a private consultant. Since then he has:

-- Served as a member of the Senior Advisory Panel to the Chairman of Commonwealth Edison to determine the strengths and deficiencies in the Company's nuclear energy program in the light of Three Mile Island.

-- Served as a member of an Advisory Committee to the President of General Public Utilities to evaluate two areas of concern after the Three Mile Island accident: personnel selection and training; and man/machine interface and communications.

-- Participated in the Department of Energy/New York State program to find suitable ways to solidify and remove high-level radioactive wastes which are located at West Valley, NY.

-- Served as chairman of a team which evaluated and advised ways to improve the nuclear engineering and construction programs of the Washington Public Power Supply System.

-- Served as chairman of a committee of experts formed to advise the Department of Energy concerning the merits of various processes for vitrifying high-level nuclear waste.

-- Served as a consultant to Houston Lighting and Power Company in an evaluation of the Engineering Assurance Program for their South Texas nuclear plant.

-- Served as chairman of a Technical Audit Associates panel which audited the Washington Public Power Supply System's program for verifying the design and construction of their WNP-2 Nuclear Station.

-- Served as a member of a special study group formed to advise the Nuclear Regulatory Commission on means to improve the design and construction quality of commercial reactor plants.

-- Recently assisted Admiral Rickover to prepare an assessment of GPU Nuclear Corporation's management competence to operate TMI-1.

Mr. Laney holds a B.S. degree from the U.S. Naval Academy, an M.S. degree from the Massachusetts Institute of Technology, and an MBA from the University of Chicago.

ROBERT V. LANEY
Employment History

January 25, 1984 to Present	Member GPU Nuclear Board of Directors and Chairman of Board Committee on Safety
November 1, 1979 to Present	Consultant in Energy Project Management
1972 to Nov. 1, 1979	Deputy Director, Argonne National Laboratory, University of Chicago. Responsible for all applied research and development, and for Laboratory administration of this 5300 person institution.
1970 - 1972	Associate Director, Argonne National Laboratory, responsible for nuclear reactor research and development.
1964 - 1970	Vice President and General Manager of Quincy (Massachusetts) Shipyard Division of General Dynamics. (8500 employees)
1960 - 1964	Nuclear Design and Construction Manager of Quincy Shipyard of Bethlehem Steel Company.
1954 - 1960	As U.S. Naval Captain, technical representative of the Atomic Energy Commission at the Westinghouse Bettis Atomic Power Laboratory, Pittsburgh.
1948 - 1954	Reactor Development Project Manager in the Naval Reactor Program of the Atomic Energy Commission and the Navy's Bureau of Ships, Washington, D.C.
1939 - 1948	Active duty Naval officer; various duties at sea and shore. Engineer office on carrier, destroyer, and battleship.

Robert V. Laney

Consultant
Energy Project Management

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January 31, 1984

Mr. L. O. Del George
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One First National Plaza/34th Floor
Chicago, IL 60690

Dear Mr. Del George:

I have had an opportunity to review the material which you sent, related to Commonwealth Edison's Byron Station. Since Cordell Reed suggested that you might be interested in considering a fall-back position, I have tried to take a rather negative view of things, asking what is the worst that could happen? In my opinion, the worst that could happen, based solely on reading the three documents which you sent, would be a requirement that CE verify all work performed by Hatfield and Hunter. This would be in line with ASLB's position that they lack confidence in this work and in the present re-inspection program's capability to remedy. Finally, this view recognizes that ASLB has retained control over questions related to Hatfield and Hunter work quality.

The appended notes are largely self-explanatory. The most important point is that the present program is not well suited to this larger task of verifying total work quality of one or more contractors. It was not designed for that purpose and should not be used for that purpose. If you want to consider, as a fall-back position, preparing for the larger task, the present program must be restructured.

Let me be the first to acknowledge that my understanding of the Byron situation is quite limited, and my comments may all be obvious to you. If there are points you wish to question, the attachment to this letter provides a basis for discussion.

Based on this brief exposure, I believe that I might be of some assistance to you in the Byron matter, if only because my work is primarily with so-called "troubled" utilities, a category in which CE does not fit. Please advise if we should meet in Chicago during the week of February 6.

Sincerely,

R. V. Laney

Robert V. Laney

RVL:pb
enc
cc: Mr. Cordell Reed, Vice President

00001292

Attachment B

Regulatory Climate

The Nuclear REgulatory Commission staff is demanding more forceful owner management actions to correct perceived quality control deficiencies. Some recent design and construction problems leading to extended delays or abandonments are viewed as evidence that the affected utilities were weak in experience and competence, and hence ineffective in managing their quality programs. While it can be argued that the NRC is also responsible, because of failure to intervene sooner and for escalating standards, there is a strong perception in the staff and in some Congressional quarters that individual owners have failed to meet their responsibilities.

Oversight Congressional committees and NRC commissioners question the ability of the industry to construct nuclear plants in a way which assures public safety. The same committees as well as self-appointed public spokesmen question the ability of the NRC to provide adequate assurance of safe construction. Public confidence in the NRC and in the quality of construction has been eroded by the widespread attention and economic consequences of such cases as Marble Hill and Zimmer. A broad public perception of high standards is plainly lacking. Such uncertainty now pervades NRC's surveillance and licensing process that real quality problems and seeming quality problems tend to be treated the same. This leads to an attitude which, in effect, is less comcerned with quality acceptability (even when analytically demonstrated) than with quality demonstrability.

00001293

Quality demonstrability through systematic documentation is an absolute requirement, independent of and in addition to demonstration of quality by adequate engineering, design, and test. In itself this is not new, but the degree of explicit conformance being required is.

The Byron situation should be viewed in this context. Commonwealth Edison has its own unique reputation with the NRC staff. The Byron history and record is a part of that. Obviously, both are important factors in the present proceedings, and solutions must be found within the GE/staff/ASLB framework. It is also true, however, that the wider influences alluded to above are at work. A successful recovery plan should take account of the total regulatory climate as well as individual Byron problems.

From this viewpoint I have reviewed the three documents sent me by Mr. Lou Del George on January 23. These are: CE letters of February 23, 1983, and January 12, 1984, to Region III describing the reinspection plan and summary of its results, and the ASLB "Initial Decision", dated January 13, 1984. In the comments which follow, I look at the CE reinspection plan in terms of its adequacy to achieve two different objectives: first, its declared objective, "... to provide additional assurance that contractor quality control inspectors were properly trained and qualified..." (CE letter of February 23, 1983, page 1); and second, its implicit objective, "These evaluations indicate that the reinspection program is confirming the quality of construction at Byron..." (CE letter of January 12, page 2). Despite

similarities these are actually two distinct tasks requiring different approaches. The present reinspection program, after remedying several weaknesses which are mentioned below, appears capable of meeting the first of these two objectives. I feel less confident that the present reinspection program is structurally adequate to accomplish the second objective.

If we were to assume that, in the future, Byron were required to respond to ASLB's statement "The Board does not have confidence that the quality of the work at Byron by Hatfield is adequate to provide reasonable assurance that the Byron facility can be operated without undue risk to the public health and safety," (ASLB, p. 299, para. D-434), it is doubtful that the present program is adequate.

Comments on the present reinspection program's adequacy to meet the two objectives follow, presented separately.

Program's Adequacy to Validate Qualification of QC Inspectors

I believe the principal parameters by which to assess the program's adequacy for the stated purpose are suitable and defensible, provided several peripheral weaknesses are corrected. The strengths are in the size of the sample of inspectors, greater than one in five; the demonstrated diversity of the kinds of work covered; the large number of reinspections made; and the automatic sample enlargement process. These, together with the numerical results yielded by the completed process, provide the principal basis for concluding that the inspectors performed competently at the times of the original inspections.

The process is susceptible to criticism in several areas, and its overall conclusions would be bolstered if these were successfully addressed in subequent reports. If this is not done there is a possibility that the reinspection program's credibility could be harmed by attacks on matters of secondary importance, such as:

- Explain how the independence of the re-inspectors was maintained. How did you assure yourself that inspectors did not re-inspect their own work? How were the re-inspectors instructed by their management in order to encourage "independent" re-inspection?
- How did you assure yourself that the re-inspectors, at the time of re-inspections, were properly trained and certified? Bear in mind the ASLB statement that they "...do not have assurance even today that applicant has met those responsibilities..." (referring to an effective QA program - See page 299, ASLB)
- Explain the significance, in terms of overall re-inspection process credibility, of inaccessible work. Is the volume of work in this category a small fraction of the whole? Is it of less concern by its nature? Are there other ways of establishing its acceptability?
- ASLB page 300, D-438, seems to assert that Hatfield's re-inspection record-keeping excluded certain deficiencies from inspector trending data, thus laying a basis for questioning the accuracy of the process. This should be answered.

00001296

- Re-inspection letter (January 12) states that the inspector selection process assures that the entire period of work performance is covered. This is not obvious, but is readily susceptible to positive demonstration.
- Some rational should be offered to explain why third party inspections always increase the percent of work found acceptable, and in at least one instance raised the percent above the 90 percent threshold.

One last, minor point: I am unable to find the data which justifies the 96.4 percent in letter of January 12, Table A.7, page 32. Probably the number is correct, but I could not derive it.

<u>Program's Adequacy to Confirm Quality of Work at Byron</u>

The ASLB, p. 299, stated -- "The Board does not have confidence that the quality of the work at Byron by Hatfield is adequate to provide reasonable assurance that the Byron facility can be operated without undue risk to the public health and safety." CE's letter of January 12 states that "These evaluations indicate that the re-inspection program is confirming the quality of construction at Byron."

If (1) CE believes that it may become necessary to address the broader question of the acceptability of Byron construction, or of Hatfield construction, and (2) if a program of re-inspection is to be a principal part of the response, then the present re-inspection program would not, in my opinion, be suitable for such a purpose. If CE were to set out to verify the adequacy of construction quality, either in-toto or contractor

by contractor, the re-inspection plan would employ a different approach. Among the differences are these:

- Work samples chosen for re-inspection would be based upon percentages of total work quantities, selection of work types and attributes having a history of difficulty, work performed in all time intervals, work performed by contractor on-site and by suppliers off-site, work performed by second-tier contractors, etc. In comparison with this, under the present plan, work was selected by a random choice of inspectors without regard for the nature of the work. The actual diversity of work types achieved is circumstantial and not optimum.

- Attributes for re-inspection would be selected based on records of difficult-to-inspect attributes and for those having special safety significance, i.e. radiography of welds in pressure boundaries.

- Re-inspecting the work of only one piping inspector would be an insufficient quantity. Same for single cable pan and bolting inspector.

- Discovery of defects upon re-inspection would require a consideration of whether the defect might indicate a generic or a singular fault. Simply repairing the discovered defect might not suffice.

This list could be expanded, but its purpose is merely to show that a re-inspection program for the broader purpose stated above would require fundamental changes.

00001298

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March 1, 1984

Mr. L. O. Del George
Assistant Vice President
Commonwealth Edison
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Dear Lou:

My comments on the "Byron Q. C. Inspector Reinspection Program" of February, 1984, are attached. As in my January comments on the preceding documents, I have adopted a critical attitude, asking, "if I were going to attack the report's credibility, where would I start?" I find two vulnerable targets.

The first is a weakness in the case which is made to support the conclusion that "The quality of construction work at the Byron Station was determined to be good." (page ES-5) The second is what seems to me to be an error in logic in sample selection. While neither of these threatens the total impact of the report, they are weaknesses and you should plan your defenses. The two targets are identified in the following paragraphs and described more fully in the attachment.

First, the broad conclusion on the quality of all work at Byron, quoted above, is weakened by the report's failure to estimate the amount or importance of inaccessible work (see item I of the attached notes).

Second, replacing a non-qualifying inspector who had no inspections beyond three months with the next inspector listed and dropping the first inspector's results from the tally is a non-conservative action. (See item II of the attached notes.) (I have assumed his results were dropped because I can find nothing in the report to the contrary.)

Item III of the attached notes may be useful to you in helping to explain the "human factor" which enters into reinspections.

00001299

Attachment C

To repeat, neither of the vulnerabilities mentioned should seriously hurt you, but they might allow an aggressive critic an opening. You should be prepared, or out ahead, on both.

Since I am going to be out west next week and I want to meet your March 15 date, I have read the report somewhat hurriedly. If there is anything to add later, I will call you.

Sincerely,

Bob

Robert V. Laney

RVL:pb
enc
cc: Cordell Reed (w/enc)

00001300

NOTES ON BYRON REINSPECTION PROGRAM

I. Quality of the Work

The report mentions frequently that only accessible and recreatable work was reinspected, but does not indicate whether this is a significant omission. While it is true that inspection results for work which is accessible tell us something about the quality of inaccessible work, omitting the latter may or may not be a significant factor in the overall conclusion. The fraction of the total which is inaccessible is a cause for concern, if only because it seems to be ignored.

An appropriate place to discuss this would be on page VII-5, Sampling Adequacy, following the sentence which says that, by sampling, one can make inferences about a larger population provided the larger population is homogeneous. One could argue that your basis for asserting a sufficient sample size breaks down by its failure to start with a statement of the total population and its accessible and inaccessible fractions.

This difficulty is pointed up in the case of Peabody. Only 6 of 37 inspectors could be reinspected; 31 inspectors had no reinspectable items (page III-4, Table III-1). The 6 inspectors who were reinspected had a 75 percent acceptance rate on subjective (visual welding) factors and a 75 percent acceptance rate on objective factors (App. A, Table A-8).

The report's overall conclusions on Peabody are stated on page V-2 and in Appendix C-2, pages 14 and 15.

The latter reads as follows: "The work performed by Peabody Testing has been determined to be of good quality and no further inspections are warranted. This conclusion is based on the small scope of work performed by Peabody Testing, the small number of discrepancies, and the evaluation as expanded to 100 percent of the reinspectable work which determined that no discrepancy had design significance."

The reader knows, however, that:

- a 25 percent discrepancy rate was found upon reinspection, hardly a "small number";
- 31 out of 37 Peabody inspectors could not be reinspected; and
- the character of the non-reinspectable work is unmentioned.

To accept these conclusions one has to make some mental disposition of the work of 31 unreinspectable inspectors, but without knowing what that work is.

I recommend that you look closely at this non-reinspectable fraction for all contractors to determine:

- is it homogeneous, that is, is the non-accessible sufficiently similar to the accessible so that the accessible can be treated as a representative sample of the whole?
- what fraction is the accessible of the total?
- is any of the inaccessible of a particularly sensitive nature?

00001302

II. Sample Selection

On page III-6, paragraph 3, the following appears: "If an inspector had no inspections beyond 3 months and did not meet the Program acceptance criteria, the next inspector listed chronologically was substituted." The reader must assume, since nothing to the contrary appears, that the negative results of the first inspector's 3 months are dropped from further consideration and from the record.

This substitution of another randomly selected inspector, accompanied by dropping the negative (non-qualifying) results of the first inspector, is non-conservative. A known negative sample is dropped, classed as indeterminate, and a replacement, neutral sample is substituted.

Yet, in Section VII, page 6, paragraph 3, and elsewhere, the report refers to use of the first 3 months as a "conservative bias". Further, in Section VII, page 8, second paragraph, the report is said to provide an "adequate basis for drawing inferential conclusions on the entire population of inspectors." These assertions can be attacked with some logic, I believe, if your sampling plan allows scrubbing an inspector's work from the record after you find he fails to meet the criterion.

Insofar as sampling logic is concerned, this could be remedied by retaining the non-qualifying data from the first inspector in the base and using it in calculating discrepancy rates.

III. Reinspections Produce More Rejects Than Original Inspections

On page ES-5, paragraph 3, the report refers to "human factors," without elaboration, to explain why there is a higher discrepancy rate for subjective factors between original inspections and reinspections. There is a logical explanation for this and it would be well for CE spokesmen to be prepared in case the point comes up during hearings. The point could, of course, be elaborated in the text if you think it useful.

It has been observed in other projects that inspectors doing reinspections, especially when they know that their work will be closely scrutinized, tend to become more conservative. In work such as visual weld inspections involving subjective standards, a significant number of cases will be found to lie in a border zone between accept and reject. It is reasonable that a larger fraction of such borderline cases would be rejected in reinspection than during the initial inspection. If one wanted to look for confirmation of this generalization, he would look to see if there actually were a substantial number of borderline cases, and if the observed disparity between inspection and reinspection could be explained by the more conservative treatment referred to. Note, for example, Table C-2, Appendix C, which shows that three-fourths of the discrepancies are of the Y category.

This rationale is reenforced by CE's finding (Appendix C-1) that none of the weld discrepancies are design-significant.

Although the inspector is not supposed to inject his own opinions of design-significance, it is reasonable to assume that if the original inspector should assert his own engineering judgement, he would be most likely to do so in a case which is borderline as to acceptability. A reinspector, on the other hand, would scrupulously observe only the defined attributes and would rule out use of engineering judgement. This would obviously cause a discrepancy in findings.

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March 12, 1984

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Assistant Vice President
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Dear Lou:

I write to advise that, in preparing my letter to you of March 1, I failed to observe that Table Q9-1 and text on pages F-7 through F-9 in Appendix F contain an adequate answer to my concern about non-reinspectable and non-recreatable work. Now that I have seen it, I request that you disregard comment I attached to my letter of March 1.

Sorry for the error.

Sincerely,

Bob

Robert V. Laney

RVL:pb
cc: Cordell Reed

00001306

Attachment D