

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:
Morton B. Margulies, Chairman
Dr. Richard F. Cole
Dr. Dixon Callihan

DOCKETED
USNRC

'82 SEP 13 11:18

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

SERVED SEP 13 1982

In the Matter of
COMMONWEALTH EDISON COMPANY
(Byron Station, Units 1 and 2)

Docket Nos. STN 50-454 OL
STN 50-455 OL

September 10, 1982

MEMORANDUM AND ORDER RULING ON MOTIONS
FOR SUMMARY DISPOSITION OF DAARE/SAFE CONTENTIONS

NRC Staff and Applicant moved pursuant to 10 CFR 2.749 for summary disposition of admitted contentions of the DeKalb Area Alliance for Responsible Energy and the Sinnissippi Alliance for the Environment (hereinafter referred to as DAARE/SAFE), on June 4, 1982 and June 7, 1982 respectively. The admitted contentions, designated as 1, 2, 2(A), 3, 4, 6, 7, 8, 9(a), (b), (c), (d) and (e) are set forth in the attached appendix. Applicant's motion was directed to all contentions except for 9(c) concerning the issue of steam generator tube integrity. The Staff motion was directed to all contentions except 1, dealing with applicant's ability to operate Byron Station and part of 3, dealing with emergency planning.

DAARE/SAFE with Licensing Board permission filed its answer on July 19, 1982, opposing the motions for summary disposition of contentions 1, 2, 2(A), 3, 6, 8, 9(a), (c) and (e). As to contentions 1, 2, 2(A), 3 and 9(c) it submitted statements of material facts it contends

DS02

that there exist genuine issues to be heard. Intervenor continued its opposition to the motions pertaining to contentions 6, 8, 9(a) and (e) but made no filings as to them. DAARE/SAFE did not oppose the motions for dismissal of contentions 4, 7, 9(b) and (d), which are granted and those contentions will not be considered further.

On July 14, 1982, NRC Staff filed a response to Applicant's motion for summary disposition in which it agreed with Applicant on contention 1 concerning its ability to operate Byron safely; raised asserted shortcomings in Applicant's evacuation time estimates, pertaining to contention 3(e); and sought an evaluation of an incident in Yugoslavia pertaining to water hammer which is taken up in contention 9(a).

Applicant with Licensing Board permission on July 19, 1982, filed an answer to NRC Staff's motion for summary disposition of DAARE/SAFE contention 9(c), claiming that there was no genuine issue as to any material fact in contention 9(c) except for one issue namely the consideration of steam generator tube failure concurrent with other design basis accidents. On July 30, 1982 DAARE/SAFE filed a motion to respond to Applicant's foregoing submission which has been granted as being in substantial compliance with 10 CFR 2.749.

DAARE/SAFE on July 30, 1982 filed a motion to supplement its answer of July 19, 1982 to Applicant's and Staff's motions for summary disposition of Intervenor's contentions 2 and 2(A) on radioactive releases. In seeking to submit an affidavit of a

professor of radiological physics, it is asserted the affidavit was not available to Intervenor on July 19, 1982, is directly pertinent to Intervenor's contentions and consists of data only recently available to the scientific community such that it could not have been incorporated into Applicant's risk assessment. Applicant objected by a filing of August 10, 1982 and NRC Staff by a response of August 13, 1982. DAARE/SAFE came back with another submission on August 14, 1982. A review of the professor's proposed filing disclosed that the underlying studies referred to were published at a time when they were available for incorporation into Applicant's risk assessment contrary to Intervenor's assertion. The tendered affidavit was not responsive to the motions for summary disposition and cannot be considered an answer as was claimed in the July 30, 1982 motion. The proffer was rejected as untimely and unauthorized as announced at the prehearing conference.

The authority of a licensing board to dispose of contentions on a motion for summary disposition is set forth in 10 CFR 2.749. It provides a means for eliminating prior to hearing those matters as to which there is no genuine issue of material fact. The proper employment of the regulation should result in only contested issues involving genuine disputes over material facts going to hearing. To that end the regulation sets forth in detail what filings parties must make for fulfilling its requirements and what are the burdens of proof. Section 2.749(a) provides in part, "All material facts set forth in the statement

required to be served by the moving party will be deemed to be admitted unless controverted by the statement required to be served by the opposing party". Section 2.749(b) states in part, "When a motion for summary decision is made and supported as provided in this section, a party opposing the motion may not rest upon the mere allegations or denials of his answer; his answer by affidavits or as otherwise provided in this section must set forth specific facts showing that there is a genuine issue of fact. If no such answer is filed, the decision sought, if appropriate, shall be rendered."

The Summary Disposition on Pleadings segment of the Commission's rules of practice is comparable to Rule 56 of the Federal Rules of Civil Procedure and has been similarly interpreted. "United States Nuclear Regulatory Commission Staff Practice and Procedure Digest, Digest No. 2," NUREG-0386, succinctly summarizes at pages 35 and 36, the application of the rules and which we have followed in deciding the subject motions. A pertinent portion of the summary follows:

Based on judicial interpretations of Rule 56, the burden of proof with respect to summary disposition is upon the movant who must demonstrate the absence of any genuine issue of material fact. J. Moore, Federal Practice, Vol. 6, Ch. 56, para. 56.15[3] (2nd ed. 1966). To meet this burden, the movant must eliminate any real doubt as to the existence of any genuine issue of material fact. Poller v. Columbia Broadcasting Co., Inc., 368 U. S. 464 (1962); Sartor v. Arkansas Natural Gas Corp., 321 U. S. 620, 627 (1954). The record and affidavits supporting and opposing the motion must be viewed in the light most favorable to the party opposing the motion. See Public Service Co. of New Hampshire (Seabrook Station, Units 1 and 2), LBP-74-36, 7 AEC 877 (1974) and cases cited

therein at pp. 878-79. The opposing party need not show that he would prevail on the issues but only that there are genuine issues to be tried. American Manufacturers Mut. In. Co. v. American Broadcasting - Paramount Theaters, Inc., 388, F.2d 272, 280 (2d Cir. 1967). The fact that the party opposing summary disposition failed to submit evidence controverting the conclusions reached in documents submitted in support of the motion for summary disposition does not mean that the motion must be granted. The proponent of the motion must still meet his burden of proof to establish the absence of a genuine issue of material fact. Cleveland Electric Illuminating Co. et al. (Perry Nuclear Power Plant, Units 1 & 2), ALAB-443, 6 NRC 741, 753-54 (1977).

The Licensing Board first made known its rulings on the motions for summary disposition on August 18, 1982 at a prehearing conference held at Rockford, Illinois. There follow the rulings and the reasons for them.

DAARE/SAFE Contention 1

As its first contention, DAARE/SAFE asserts Applicant has a record of noncompliance with NRC regulations at its other nuclear stations which demonstrate its inability, unwillingness, or lack of technical qualifications to operate the Byron Station within NRC regulations. It requests that in order to protect the public health and safety Commonwealth Edison Company should not be granted an operating license unless it demonstrates that improvements in management operations and procedures will ensure its willingness, ability and technical qualifications to operate within NRC rules and that these improvements will be enforced.

The detailed record of noncompliance intervenor relies upon is not open to significant dispute. It cites fines totalling \$105,500 being levied on Applicant from 1974 through 1978, a February 1977 NRC report noting deficiencies at Applicant's plants

particularly Zion and low ratings in 1974 at 3 plants; deficiencies at Dresden in 1977 and at 2 other plants led to increased inspections by NRC. Applicant had reported abnormal occurrences to NRC and the latter had found violations. A federal grand jury indicted Applicant and several of its employees on 9 counts of fraud and conspiracy relating to security regulation requirements at Quad Cities Station in 1977. Following a trial the defendants were found not guilty. On 3 occasions shipments of low level waste from Applicant's plants were barred from disposal in South Carolina and Washington because of a failure to meet packing and transportation requirements. In addition to being barred from the sites, fines were imposed by NRC for the violations which occurred in June, 1980, December, 1980 and February, 1982.

Matters submitted by DAARE/SAFE in support of contention 1 which could be afforded no weight were: (1) an unsubstantiated general allegation that at all of Applicant's plants Commonwealth Edison Co. failed to observe on a continuing and satisfactory basis applicable quality control and quality assurance requirements; (2) allegations of management knowingly covering up defects at the LaSalle Station as part of a commitment to profits and not to safe construction, which were referenced to an affidavit of "Gogol" but which was not submitted; and (3) the affidavit of Michael D. Molander purporting to offer an expert's opinion evaluating the compliance record of the Applicant. Mr. Molander, a programmer with prior employment as a pollution control

technician was not shown to have any expertise in the area of Nuclear Regulatory Commission regulation or the nuclear energy field. The data he based his opinions on was never detailed.

Other material facts of record that are not in dispute place the specified record of noncompliance of Applicant in proper perspective and from which it cannot be concluded that Commonwealth Edison Company's record at its other nuclear stations demonstrates an inability, unwillingness or lack of technical qualifications to operate the Byron Station as required.

Applicant has been operating nuclear power stations since the late 1950's (Stiede Affidavit at 3). Seven reactors are now operated and it has 6 additional under construction, including the 2 Byron units (Stiede Affidavit at 12). Applicant had been fined and admonished in the manner indicated by intervenor. This has caused Applicant, since 1978, to direct efforts to eliminate deficiencies and achieve compliance with NRC regulation.

Commonwealth Edison Company retained an independent consulting firm in 1978 and as a result instituted significant improvements to organization of its operating station management structure (Stiede Affidavit at 12, Querio Affidavit at 5). In 1979 it engaged distinguished scientists and business leaders from the Chicago area to evaluate the effectiveness of its nuclear operations and has improved its corporate control of nuclear operations based on recommendations made by the panel. It employs people for its nuclear operations who are technically

qualified for their job function (Reed Affidavit at 5).

Applicant's effort at compliance has been confirmed by NRC Staff as set forth in its response by July 14, 1982 and its performance has been improving. Commonwealth Edison Company plants have reportable occurrences at a rate only slightly higher than other reactors in Region III where it is located, and the number of abnormal occurrences the Commission has determined arose from events at Applicant's facilities is not disproportionate to those involving other utilities nationwide. Its performance record compares favorably with other nuclear licensees both regionally and nationally (See Staff Affidavits of William L. Fourney and James R. Creed).

Applicant's compliance record is not one approaching perfection. This is indicated by its recently having a shipment barred from a low level radiation burial site; instances of noncompliance in connection with the construction of the LaSalle Station but which were not so significant as to preclude a limited power start up (See Licensing Board Memorandum and Order of August 2, 1982 at 6 and 7); and a Commission proposal to assess a \$100,000 penalty for an overexposure incident at Zion Nuclear Power Station, based on a March, 1982 occurrence.

The foregoing confirms that occasional deficiencies continue to occur in Applicant's compliance which are of a limited nature and are sporadic at different plants. It is not inconsistent with Applicant's status as a long term, major operator of nuclear power plants, with a record of compliance comparable to the

average in the industry. This belies Intervenor's contention that Commonwealth Edison Company's record of noncompliance at other plants is so bad it demonstrates Applicant's inability, unwillingness or lack of qualifications to operate the Byron Station in accordance with NRC regulations. Applicant's motion for summary disposition of contention 1, supported by NRC Staff, is granted.

DAARE/SAFE Contentions 2 and 2(A)

Contentions 2 and 2(A) concern human exposure, within the Rockford, Sycamore, DeKalb area, to radiation expected to originate at the Byron Nuclear Station and at 11 other nuclear generating plants operated by the Applicant in northern Illinois. Contention 2 addresses radiation arising from normal operation; Contention 2(A) concerns radiation from postulated accident conditions. The contentions ask for a reevaluation of the cumulative potential exposure in view of the Applicant's alleged experience of high incidence of regulatory violations and irregularities at its operating nuclear plants in the interval since the Byron construction permit issued. Both Applicant and Staff filed motions for summary disposition of these contentions. The Board grants the motion for summary disposition of Contention 2 primarily because it constitutes a challenge to Commission regulations. The motions concerning Contention 2(A) are denied because of questions raised concerning the handling of accident frequencies.

Intervenor provided the affidavits of Dr. Carl J. Johnson and Mr. Stanley E. Campbell. Dr. Johnson, a physician specializing in public health and preventive medicine, in his affidavit, briefly and generically characterized the routine radiation releases from nuclear plants, citing

EPA estimates of cancer and birth defects which allegedly will be sustained by world-wide contamination by the uranium fuel cycle to the year 2000. Dr. Johnson states that the work of NRC is suspect because of a well-known revolving door policy with industry and because the primary mission of the agency is not to protect the environment from nuclear plant emissions. He also disagrees with NRC assessments of risk to radiation exposure citing differences between EPA and NRC in maximum permissible levels of uranium in water. Dr. Johnson provides no specific information concerning the projected releases of radioactive materials from the nuclear plants or resultant dose impacts in the Dekalb-Sycamore and Rockford areas.

Permissible emissions of radioactive substances from nuclear plants to unrestricted areas and limits on the concomitant radiation fields in those areas are specified by Commission regulations, 10 CFR Part 20 (Struckmeyer and Wohl at 1).

Additionally, operators of nuclear power plants are obligated to keep releases of radioactivity to unrestricted areas during normal operations as low as reasonably achievable (the ALARA requirements). Operating practices and procedures become a part of Technical Specifications (10 CFR 50.36a) in order that the numerical guidelines for ALARA (10 CFR 50, Appendix I) shall be met (Id. at 2).

Radiological monitoring equipment necessary to establish conformance with the Technical Specifications shall be installed (Id. at 3). Conservative dose estimates derived from various exposure pathways have been determined by Staff for realistic site-specific characteristics and lead to the conclusion that the impact on the health of the public is

very small (Id. at 7). A review by the Staff of the recent radiological-release experience of three operating nuclear facilities and estimates of three proposed plants of the Applicant predicts an average collective individual dose, within 50 mile-radius areas surrounding each facility, two orders of magnitude below the design objectives of 10 CFR 50, Appendix I. It was shown in this review that the maximum dose from Byron occurs outside the 50 mile radius population zone of each of the other facilities (Id. at 9 and Lanti Affidavit at 10 ff). Further, any significant dose to the population of Rockford will arise from Byron only.

The health effect--cancer, infant abnormality and genetic-related ill health--in the radiation field in the Rockford-Sycamore-DeKalb area as a result of the operation of the several nuclear plants in northern Illinois are expected to be undetectable. (Fabrikant Affidavit at 30; see also Morgan Deposition at 84).

Based on the affidavits provided by Applicant and Staff, the Board finds adequate demonstration that the routine releases from Byron and the other nearby nuclear power plants do not constitute an undue hazard to the health and welfare of the area residents.

The affidavit of Dr. Johnson contains little or no specific information to either substantiate the allegations implied in contention 2 or to refute the information contained in Applicant and Staff affidavits. It instead appears to be a generic attack on the Commission and its regulations. The motions for summary disposition of Contention 2 are granted.

With respect to Contention 2(A), Intervenor argues that the safety analysis is in error because the risk of exposure to radioactive materials from accidental releases to the people in the DeKalb-Sycamore and Rockford areas has been improperly evaluated. Intervenor cites a recent report (NUREG/CR-2497, Volume 1, "Precursors to Potential Severe Core Damage Accidents: 1969-1979 A Status Report," June 1982) as basis for its contention that both Applicant and Staff have underestimated the risk for a TMI-2 type accident. Both Staff and Applicant estimated population doses which would result from postulated accidents. (Struckmeyer and Wuhl Affidavits at 11-13; Lahti at 15). The impact of the new information, since it estimates the probability of accidents to be much higher than past studies, and does not appear to have been considered, might be such as to result in considerable change in population dose estimates. Because of the questions raised concerning the applicability and impact of these new assessments of accident probability and the effect that higher accident probabilities would have on overall risk and population dose estimates, the motions for summary disposition on contention 2(A) are denied.

DAARE/SAFE Contention 3

Contention 3 alleges that the Byron emergency plans do not comply with applicable criteria and fail to provide reasonable assurance that appropriate measures will be taken to protect the public health and safety in the event of a radiological emergency. Applicant

contends that emergency plans will either specifically consider the factors enumerated in Intervenor's contention or that it is not necessary to develop specific plans to address the factors and to assume that the public health and safety is adequately protected (John C. Golden Affidavit at 4, 5, 8 and 13). NRC Staff asserts that emergency planning will be in effect to cover those requiring such protection, as provided for under existing regulation, some of which are already in being (Robert DeFayette Affidavit at 1, 5 and 6).

Offsite emergency plans have not been completed and the Federal Emergency Management Agency has yet to submit findings on their adequacy. Staff has not rendered an overall conclusion on the state of emergency preparedness for Byron and related emergency planning zones.

The emergency planning for Byron is presently incomplete. The inadequacy cannot be overcome in effect by a mere statement that the matter will be properly attended to in time. Without the foregoing information, the motions for summary disposition are unsupported in essential areas to rule in the proponents favor, therefore the motions on Contention 3 should be denied.

DAARE/SAFE Contention 6

Both Staff and Applicant filed for summary disposition of this contention which alleges that zirconium alloy cladding is unacceptable because of the likelihood of failure due to oxidation and embrittlement and "very hazardous" because cladding failure will lead to radiation limits exceeding the design environment of internal and external safety equipment and systems and the release of radioactive materials.

Intervenor opposes the motion but filed no affidavit or statement of

material facts as to which it is contended that there exists a genuine issue to be heard. Commission rules provide that "All material facts set forth in the statement required to be served by the moving party will be deemed to be admitted unless controverted by the statement required to be filed by the opposing party." (10 CFR 2.749(a)).

The NRC Staff provided affidavits of Dale A. Powers, James E. Kennedy and Frank M. Akstulewicz. The Powers' affidavit addressed the general acceptability of the use of zirconium alloy cladding and the joint affidavit of Kennedy and Akstulewicz addressed adequacy of environmental design and qualification of safety-related equipment for radiation levels. Applicant provided the affidavit of Dr. Harry M. Ferrari which addressed the suitability of zirconium alloy as a cladding material including zirconium-water reactions and the monitoring capability to rapidly detect unacceptable cladding characteristics.

The principal basis for Intervenor's contention that zirconium cladding is unacceptable is a letter written by Dr. Earl A. Gulbransen, a former Westinghouse nuclear engineer (Bulletin of the Atomic Scientist, June, 1975, p. 5). In that letter Dr. Gulbransen states, "At the operating temperature of nuclear power reactors zirconium cladding alloys react with oxygen in water to form an oxide layer which partially dissolves in the metal, embrittling and weakening the metal tubing. Part of the hydrogen formed in the zirconium-water reaction dissolves in the metal and may precipitate as a hydride phase also embrittling and weakening the metal tubing." Dr. Gulbransen also stated that "At temperatures above 1100° Celsius zirconium reacts rapidly with steam with a large evolution of heat and the formation of free hydrogen, with most

metals to form intermetallic compounds and with other metallic oxides to form its own oxide. Once zirconium is heated to 1100° Celsius, which could occur in loss of coolant accidents, it is difficult to prevent further reaction, failure of the tubing and of the reactor." He concludes that: "The use of zirconium alloys as a cladding material for the hot uranium oxide pellets is a very hazardous design concept since zirconium is one of our most reactive metals chemically."

As to the issue of embrittlement at normal operating temperature, Applicants deposed Dr. Gulbransen and obtained an admission on his part that he was not involved in failure analysis and did not know whether the cladding would fail or not (Gulbransen Deposition at 124, 130). Applicant's deponent, Dr. Harry Ferrari, a qualified expert in nuclear fuel metallurgy, stated that, although there is some embrittlement of the zirconium under normal operation conditions, the zirconium retains an acceptable level of ductility (Ferrari Affidavit at 8).

Staff deponent, Powers conservatively calculated the amount of oxidation that would occur over the 3-year average in-pile use to be only 0.6% of the cladding thickness (0.14 mils oxide thickness compared to a cladding thickness of 22.5 mils). He concluded that there would be no significant cladding embrittlement (Powers Affidavit at 3-5). Cladding oxidation permitted under 10 CFR 50.46(b)(2) as a result of a loss of coolant accident (LOCA) is 17% of the original wall thickness. Powers also stated that the effect of the dissolution of oxygen in zirconium actually strengthens the cladding (Id. at 6).

With regard to the effect of hydrogen, Powers states that it is clear from experience that hydriding is not a problem. Experiments have established that the oxide film serves as a strong barrier to hydrogen diffusion thus retarding hydrogen pickup. This has been verified by actual measurements of in-reactor hydriding rates on spent commercial fuel rods (Id. at 5). Powers concludes that the Byron fuel will not experience an unacceptable degree of oxygen or hydrogen embrittlement (Id. at 6).

In response to the statement that if the temperature reaches 1100°C (2012°F) there is a significant risk of rapid metal-water reaction and failure of the cladding, Applicant's deponent Dr. Ferrari stated that the zirconium metal-water reaction described by Dr. Gulbransen was a primary consideration which led the NRC to establish a post-LOCA upper limit on zirconium cladding temperature of 2200°F and maximum cladding oxidation (metal-water reaction) of 1% of the core (10 CFR 50.46(b)(1) and (3)) (Id. at 9).

Concerning the ability of safety-related equipment in the Byron facility to perform their necessary safety function under radiation levels resulting from cladding failure, General Design Criteria 4 (GDC 4) in Appendix A of 10 CFR 50 requires "Structures, systems, and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing and postulated accidents, including loss-of-coolant accidents." Applicant's program to demonstrate compliance with GDC 4 is based on two NUREG documents: NUREG-0588, "Interim Staff Position on Environmental Qualification of

Safety-related Electrical Equipment" and NUREG-0737, "Clarification of TMI Action Plan Requirement." NUREG-0588 was endorsed by the Commission as the interim requirement for equipment qualifications to satisfy applicable portions of GDC 4. (See Commission Memorandum and Order (LI-80-21, dated May 23, 1980.) Although the NRC Staff has not yet conducted the site audit to confirm the adequacy of the environmental design of equipment, equipment identical to or similar to that in use at Byron has been satisfactorily tested and qualified in a comparable environment and operated as required at other Westinghouse facilities (Kennedy and Akstulewicz Affidavit at 2-4).

The design basis radiation source term assumptions and post-accident radiation service conditions associated with the design basis loss-of-coolant accident indicate that substantial fuel cladding degradation is considered even though a specific volume for fuel cladding failure is not utilized (Id. at 3). It is the Licensing Board's view that the Byron safety related-equipment will continue to perform their necessary functions under radiation levels occasioned by any design basic accidents associated with failure of zirconium alloy cladding.

The uncontroverted statements of material facts as to which no genuine issue is to be heard provided by Applicant and Staff adequately respond to the concerns contained in Contention 6. These uncontested facts demonstrate that Contention 6 does not raise any issues regarding the effects of oxygen, hydrogen and temperature on zirconium cladding that were not considered in the Commission rulemaking that established ECCS acceptance criteria, the use of which provides adequate assurance against significant cladding embrittlement and zirconium failure. The statements also adequately describe the attentions provided

to assure both detection of cladding defects (radiation monitoring) and performance level requirements for safety-related equipment under conditions of zirconium alloy cladding failure. These facts, in addition to the large body of operational and experimental evidence concerning the use of zirconium alloy cladding (all but 3 of the 162 planned and operating domestic reactors) which show that cladding failure does not result in reactor vessel failure (Powers Affidavit at 3), demonstrate to the satisfaction of the Board, that the issues raised in Contention 6 have been adequately addressed, that there exists no significant health or safety hazard to the public and there are no litigable issues remaining. Staff and Applicant's motions to dismiss Contention 6 are granted.

DAARE-SAFE Contention 8 and 9(e)

These contentions raise issues regarding the environmental and safety impacts of an assumed chemical decontamination of the primary coolant system and steam generator and Applicant's ability to perform such chemical decontamination without degrading the integrity of the system. Both Applicant and Staff filed motions for summary disposition of these contentions. Intervenor did not respond to the motion other than to state that it opposed the motions.

Applicant provided the affidavit of John C. Blomgren on Contentions 8 and 9(e). Staff provided the affidavits of John J. Hayes, Jr., on Contention 8 and Frank J. Witt on Contention 8 and 9(e).

Both Applicant and Staff contend that chemical cleaning may never be required. If decontamination becomes necessary, techniques are currently available to accomplish the necessary cleaning with no undue risk to public health and safety. (Hayes Affidavit at 2 and 10, Blomgren Affidavit at 4, 7, 12 and 15).

Primary coolant system decontamination has been proposed or conducted at only two reactors. A Shippingport, primary system decontamination was undertaken because extensive alterations of piping and components which were sources of high radiation fields, were required. (Hayes Affidavit at 2). A primary coolant system decontamination has been approved for Commonwealth Edison's Dresden facility in order to enable the licensee to comply with in-service inspection requirements and to perform major modifications of the facility (Id. at 3-5).

The Byron facility is not like Shippingport or Dresden. Byron is a Westinghouse PWR facility, based on an early 1970 design which already includes a high pressure cooling system (unlike Dresden 1) and is designed to safely accommodate all in-service inspection requirement. The circumstances which required chemical cleaning of the primary system at Shippingport and Dresden 1 are not present at Byron nor are they expected in the future (Id.).

If, for whatever reason, such decontamination would be required, a proposed plan of action would be reviewed under 10 CFR § 50.59 to determine if an unreviewed safety question was involved or a change in technical specifications required. If either the then-licensee or the Staff concluded that an unreviewed safety question or a change in technical specifications was required, then a license amendment would be required. Appropriate environmental and safety reviews would then be made by the NRC Staff prior to approval of a license amendment for chemical decontamination of the primary coolant system. Applicant and Staff both state and the Licensing Board agrees, that there are no reasons why a chemical decontamination of the primary coolant system, if

necessary, could not be accomplished without undue risk to public health and safety and without significant environmental impacts.

Concerning the chemical cleaning of steam generators, no reactor has had a steam generator chemically cleaned, and there is no reason to believe that the Byron steam generator will require such cleaning (Id. at 9). Even if chemical cleaning were necessary, the same review process described for primary coolant system chemical cleaning would be applicable and appropriate environmental and safety reviews would be completed prior to approval of a licensing amendment for cleaning of the steam generators. Also, there is no reason to believe that a chemical cleaning of the steam generators at Byron, if required, could not be conducted with adequate assurance of no undue risk to public health and safety and without significant environmental impacts.

Intervenor maintains that Applicant does not meet the requirements of 10 CFR § 51.21 and 51.20 (a), (1 and 2; (b), and (c) because no consideration was given to the environmental impact of primary coolant system chemical decontamination and steam generator chemical cleaning. Intervenor further maintains that the Final Safety Analysis Report (FSAR) is deficient because it does not deal adequately with the many unresolved safety problems related to decontamination. The Licensing Board finds that there are no litigable issues here. It has not been demonstrated that chemical decontamination will ever be required. If it is necessary, procedures and techniques are available and adequate safeguards are provided to assure the public health and safety. The Licensing Board finds that both Applicant and Staff have met their burden on this issue and the motions for summary disposition on Contentions 8 and 9(e) are granted.

DAARE-SAFE Contention 9(a)

This contention concerns water hammer events caused by rapid condensation of steam in feedwater lines. This phenomenon is sometimes referred to as bubble collapse water hammer and is believed to have occurred at Commonwealth Edison's Zion Station and the KRSKO PWR plant in Yugoslavia. The problem is associated with the steam generation system. There are two basic types of Westinghouse steam generators, the feed ring type (Zion) and the preheat type. The Byron Station steam generators are Westinghouse Model D4 (Unit 1) and D5 (Unit 2) counter flow preheat units (R. W. Carlson Affidavit at p. 7). The KRSKO steam generator is a Westinghouse Model D-4.

The differences between the Zion and Byron steam generators are such that the Byron plant is not susceptible to the type of water hammer events experienced at the Zion plant (A. W. Serkiz Affidavit at 2). The Staff is still evaluating the KRSKO plant and has not determined the applicability of the KRSKO water hammer event to other Westinghouse Type D steam generators such as Byron (Supplemental Affidavit of A. Serkiz at 2).

Westinghouse has recommended certain modifications to the feedwater bypass system, which if implemented at Byron should reduce the likelihood of bubble collapse water hammer in the steam generators. The modifications involve the installation of temperature sensors. (Carlson Affidavit at 17-19). Applicant is considering alternative locations of the sensors (Bowen Affidavit at 4). Although the modifications under consideration may well eliminate the likelihood of bubble collapse water hammer in the steam generators at Byron when employed, NRC Staff has not had the opportunity to evaluate the event at KRSKO PWR plant in Yugoslavia.

Until the event is evaluated and a report made by Staff, it would be premature to determine if a genuine issue of material fact continues to exist on the question of water hammer. Applicant at the prehearing conference was against continuing the matter until Staff completes the KRSKO evaluation and reports its findings. Because all necessary information for deciding the motions for summary disposition on Contention 9(a) has not been furnished, the motions are denied.

DAARE-SAFE Contention 9(c)

The NRC Staff filed for summary disposition of this contention which concerns steam generator tube integrity. Staff filed the joint affidavits of Emmett L. Murphy and Jai Raj H. Rajan in support of its motion. Applicant responded to the motion, supporting in part and objecting in part, providing the affidavits of Daniel D. Malinowski and Edward M. Burns. Intervenors timely filed affidavits of Richard Bunch and Michael Jenkins in opposition to the motion.

Intervenor contends that the necessary information which would prove there are no genuine issues in dispute is not yet available. The Licensing Board agrees with Intervenors on two aspects of the steam generator issue--a relatively recent problem of flow induced vibration and subsequent wear of tubes in Westinghouse steam generators of the Byron type (Model D) and the necessity of considering steam generator tube failure concurrent with other design basis accidents.

Indications of tube wear have been observed in steam generators of Westinghouse-designed nuclear power plants. The problem is apparently in the preheater section of model D steam generators. To date, only one nuclear power plant with steam generators of the type to be employed at Byron has conducted power operations. Westinghouse is currently

evaluating the tube vibration phenomenon through an extensive analysis and test program in conjunction with appropriate utilities. The program involves gathering and analyzing operating plant data and data obtained from both air and water scale model tests. Several design modifications are currently under review as possible solutions to the tube vibration problem and it is anticipated that, as a result of these current studies, some level of design modification may be necessary for the Byron Station steam generators to permit long-term operation at full power (Edward W. Burns Affidavit at 3-9). It is anticipated that the Westinghouse study of tube vibration issue will be completed in early 1983 at which time the recommended course of action will be presented to the NRC Staff for its review (Id. at 8 and Murphy/Rajan Affidavit at 4-5).

As a part of its activities under Task Action Plan A-3, the Staff is considering the consequences of steam generator tube failure concurrent with other design basis accidents (Murphy/Rajan Deposition of July 7, 1982 at 104-108, 147-151, 157-160 and Deposition Exhibit No. 1 "Steam Generator Status Report, February 1982, U.S. Nuclear Regulatory Commission," at 2-5). Applicant states that neither the NRC Staff's SER for the Byron Station nor the Murphy/Rajan joint affidavit which was filed in support of the Staff's motion for summary disposition address this matter.

The Board considers the Westinghouse Model D induced vibration/wear problem and tube failure concurrent with other design basis accidents to be central to the steam generator tube integrity issue. The Licensing Board finds that on these two issues, the necessary information upon which to determine whether there are material genuine issues of fact in dispute

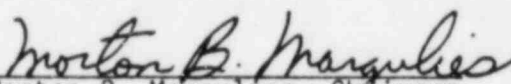
is not available and the motion for summary disposition is denied.

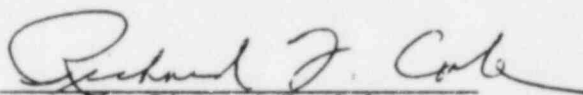
ORDER

Upon consideration of all of the foregoing, the motions for summary disposition made pursuant to 10 CFR 2.749 by Commonwealth Edison Company and NRC Staff pertaining to DAARE/SAFE's admitted contentions are granted as to Contentions 1, 2, 4, 6, 7, 8, and 9(b), (d) and (e) and denied as to Contentions 2(A), 3, 9(a) and (c). Contentions 1, 2, 4, 6, 7, 8, and 9(b), (d) and (e) are dismissed.

It is so Ordered.

THE ATOMIC SAFETY AND
LICENSING BOARD


Morton B. Margulies, Chairman
Administrative Judge


Dr. Richard F. Cole
Administrative Judge


Dr. Dixon Callihan
Administrative Judge

Dated at Bethesda, Maryland
this 10th day of September, 1982.

DAARE/SAFE ADMITTED CONTENTIONSCONTENTION 1

Intervenors contend that the record of noncompliance with Nuclear Regulatory Commission regulations by the Applicant in its other nuclear stations demonstrates its inability, unwillingness, or lack of technical qualifications to operate the Byron Station within NRC regulations and to protect the public health and safety as required under 10 CFR 50.57(a) (1) (2) (3) (4) and (6), and that therefore the Applicant should not be granted an operating license unless it demonstrates that improvements in management, operations, and procedures will ensure its willingness, ability and technical qualifications to operate within NRC rules; and that these improvements will be enforced.

CONTENTION 2

Intervenors contend that since residents of the DeKalb-Sycamore and Rockford areas, the zones of interest of DAARE and SAFE, are surrounded by 11 other nuclear generating units in operation or under construction (at Dresden, Quad-Cities, LaSalle, Zion and Braidwood) in addition to the two units at Byron, that the Applicant should re-evaluate the dose impacts of projected routine releases of radioactive materials (Chapter 11, FSAR) to determine the cumulative effects to residents from the addition of Byron releases to release from the other 11 units. This re-evaluation is especially critical in light of Applicant's record of incidents at its other plants, since the granting of the Byron Construction License. This re-evaluation should be performed to ensure that applicable NRC (10 CFR Part 20 and 10 CFR Part 50, Appendix 1) and EPA (40 CFR 190) limits for radionuclide releases and exposures are not exceeded in practice for DeKalb-Sycamore and Rockford area residents due to the addition of the Byron units to other units in operation or under construction, and should focus upon both the projected and potential aggregate dose levels to these residents, and upon the known and potential effects of such projected and potential cumulative dose levels.

CONTENTION 2(A)

Due to the concentration of nuclear power plants already in Northern Illinois; the Applicant's record of incidents and violations in existing plants which have emerged since the granting of a Construction License for Byron; and the credibility which must now be given to large scale accident scenarios since TMI, Intervenors contend that the addition of Byron Station operations places an undue and unfair burden of risk from exposure to radioactive materials from accidental releases on DeKalb-Sycamore and Rockford area residents. With the addition of two more nuclear power units in operation at Byron, the potential for cumulative dose effects from discrete accident events at plants in Northern Illinois under unfavorable meteorological conditions poses an unreasonable level of risk to the health and safety of DeKalb-Sycamore and Rockford area residents.

CONTENTION 3

Intervenors contend that the FSAR does not adequately describe the elements set forth in 10 CFR Part 50, Appendix E, IV, D as required by 10 CFR Part 50, Appendix E, 111, nor is the actual emergency plan presently planned to be used by Applicant in compliance with said criteria, so as to demonstrate that the Applicant's emergency plans for the Byron Station provide reasonable assurance that appropriate measures can and will be taken in the event of an emergency to protect public health and safety and prevent damage to property. Intervenors further contend that Applicant's emergency plan for Byron is inadequate in that it fails to take into account any of the following factors, each of which must be factored into emergency plans for them to be meaningful and adequate:

- a. that the evacuation of the affected areas would necessitate the evacuation of more than twenty-thousand students attending Northern Illinois University in DeKalb, most of whom rely upon public transportation, or those without cars at other colleges in the affected areas.
- b. that, in the event of an acute gasoline shortage coinciding with the need for evacuation, contingency plans for evacuation of those otherwise able to transport themselves by means of gasoline-powered vehicles, including public transportation, would need to be transported by other means.
- c. that in the event of an accident requiring evacuation, there is no assurance that local and state and national authorities required to interface will in fact themselves have plans in place which adequately protect the affected public both within and without the LPZ.
- d. that in the event of an accident requiring evacuation, Applicant and others have plans in place to take emergency measures other than evacuation because evacuation is or may be impractical in many affected areas.
- e. that in the event evacuation is required, Applicant has no plans to deal with weather-dependent worst case analysis or the potential consequences of a core melt with breach of containment.

CONTENTION 4

Intervenors contend that the Applicant's Final Safety Analysis Report (FSAR) does not comply with 10 CFR Part 50.34(b)(4) in that the FSAR and Applicant fail to take into account all "pertinent information developed since the submittal of the preliminary safety analysis report" as required by 10 CFR 50.34(b)(4). Specifically, Intervenors contend that the FSAR does not analyze the risks to the public health and safety from the potential of accidents resulting from multiple, mutually independent failures as opposed to a "single failure", as defined in 10 CFR Part 50,

Appendix A. Applicant's Chapter 15 FSAR examines a set of single failure scenarios. The potential of multiple failure accidents has become more apparent since March and April of 1979 at which time the nuclear generating plant at Three Mile Island near Harrisburg, Pennsylvania, experienced an accident resulting from multiple, mutually independent failures, that is, failures which occurred in proximate time to one another without actually being caused by one another. In 10 CFR Part 50, Appendix A, Introduction, it is noted that even though no specific design criteria for a problem has been defined, Applicant is not relieved from the obligation to consider new important safety matters, in this case, in its analysis of accident risk and prevention under the requirements of 10 CFR 50.34(a)(4)(i) and (ii), and 10 CFR 50.34(b)(4).

Examples of multiple failure accidents can be found in a report written by Dr. Richard E. Webb entitled "An Analysis of Three Mile Island Accident," 1979. Quoting from Chapter 12 of that report:

- (1) Rupture of a defective control rod drive mechanism (CRDM) housing which causes adjacent, similarly defective CRDM housings to rupture in a cascade manner. Such ruptures could cause the affected control rods to be ejected from the core by the reactor pressure, thereby causing a potentially catastrophic power excursion.
- (2) Failure of the main feedwater system followed by a scram system failure, which results in a high level of heat generation in the core of the reactor but low heat removal from the reactor system.
- (3) Seizure of a main coolant pump followed by a scram failure.
- (4) Continuous withdrawal of control rods with a scram failure.
- (5) Loss of electric power to the coolant pump followed by a scram failure.
- (6) Loss of turbine steam condenser vacuum with scram failure.
- (7) Small coolant pipe rupture with a scram failure.
- (8) Large coolant pipe rupture followed by failure of the emergency coolant system to function.
- (9) Spontaneous reactor vessel explosion due to failure of defective closure bolts.
- (10) Errors in regulating the boron chemical concentration in the reactor coolant causing excessive over-power transients or power excursions.
- (11) A large pipe rupture followed by failures of additional pipes and components due to the reaction forces that occur as a result of the pipe rupture.

- (12) Coolant pipe rupture due to a strong pressure surge caused by a core power or under-cooling incident; or a simultaneous rupture of a set of defective control rod drive mechanism housings due to a strong coolant pressure surge, water hammer, or a coolant explosion caused by a molten fuel-water interaction in an accident in which the fuel melts.
- (13) Steam generator vessel rupture.
- (14) Improper operator actions in response to a particular accident situation which tends to worsen the accident.
- (15) Accidents caused by faulty gauges and instruments.

CONTENTION 6

The Intervenor contend that the FSAR provides insufficient assurance of containment of radioactive materials in light of, among other factors, the risks of use of zirconium cladding alloys resulting in a breach of the integrity of both internal and external systems. Our evidence for the unacceptability of zirconium cladding includes the matter contained in a letter to the Bulletin of Atomic Scientists by former Westinghouse nuclear engineer, Earl A. Gulbransen, published on page 5 of the June, 1975 issue of that journal. Quoting Dr. Gulbransen from that letter: "At the operating temperature of nuclear power reactors zirconium cladding alloys react with oxygen in water to form an oxide layer which partially dissolves in the metal, embrittling and weakening the metal tubing. Part of the hydrogen formed in the zirconium-water reaction dissolves in the metal and may precipitate as a hydride phase also embrittling and weakening the metal tubing." Further evidence of risk of using zirconium alloys occurs a bit later in the same letter: "At temperatures above 1100° Celsius zirconium reacts rapidly with steam with a large evolution of heat and the formation of free hydrogen, with most metals to form intermetallic compounds and with other metallic oxides to form its own oxide. Once zirconium is heated to 1100° Celsius, which could occur in loss of coolant accidents, it is difficult to prevent further reaction, failure of the tubing and of the reactor."

Thus the conclusion is reached by Dr. Gulbransen that: "The use of zirconium alloys as a cladding material for the hot uranium oxide fuel pellets is a very hazardous design concept since zirconium is one of our most reactive metals chemically."

Additionally, Applicant has not demonstrated the adequacy of its internal and external safety systems as impacted by a zirconium cladding failure. In the event of a loss of integrity of zirconium cladding, radiation levels exceeding those of the design environment of the internal and external safety equipment and systems would occur. As the design basis for these systems and equipment does not include an integrity assurance in the event of a zirconium cladding failure by failing to consider such potential radiation levels in the design environment of the internal and external safety systems, Intervenor contends that the proposed use of zirconium cladding, and the impact on the internal and external safety systems and equipment in the event of a zirconium cladding failure, require further examination.

CONTENTION 7

The Intervenor contends that the FSAR and Applicant offer insufficient safeguards against hydrogen explosions, such as are alleged to have occurred at Three Mile Island Reactor 2. There is no evidence that the recombiners for taking up hydrogen would be adequate if circumstances similar to those at TMI-2 should occur at Byron.

CONTENTION 8

Intervenors contend that Applicant does not meet the requirements of 10 CFR Part 51.21 and 51.20(a), (1 and 2); (b), (c) because no consideration is given the environmental impact of primary coolant system chemical decontamination and steam generator chemical cleaning which the Department of Energy has determined will occur twice during the lifetime of a nuclear power plant. Recent data raise the possibility of serious adverse consequences of the decontamination process. Chelating agents, intended for the removal of highly radioactive corrosion products adherent to the coolant system surfaces, sharply increase the rate of migration of these same radioactive products through the environment and into the food chain. No analysis or discussion is given possible biological consequences to the accidental spillage during decontamination, waste storage, transportation or disposal (on or off-site).

CONTENTION 9(a)

Intervenors contend that there are many unresolved safety problems with clear health and safety implications and which are demonstrably applicable to the Byron Station design, but are not dealt with adequately in the FSAR. These issues include but are not limited to:

- a. Serious water hammer problems. We understand that a water hammer caused by rapid condensation of steam in feedwater lines of a PWR constitutes the most serious of this sort of event. Damage to pipes and valves are some potential hazards. Ultimately, under the most serious circumstances successive water hammer incidents might lead to a loss of coolant accident. Applicant has already had water hammer problems in its Zion plant in 1977, and a plant shutdown was required to repair the damage. The similarity of plant equipment, management, and operator training programs between the Zion and Byron stations raises serious questions about the Applicant's ability to operate the Byron plant safely, with respect to water hammer phenomenon. Evidence with respect to demonstrated efficacy of new nozzle designs to be used at Byron to mitigate water hammers is not presented at FSAR 10.4.7.3.

CONTENTION 9(b)

Intervenors contend that there are many unresolved safety problems with clear health and safety implications and which are demonstrably applicable to the Byron Station design, but are not dealt with adequately in the FSAR. These issues include but are not limited to:

- b. Asymmetric blowdown loads on reactor primary coolant system. This problem may develop from reactor coolant pipe rupture at the vessel nozzle. The result, after a LOCA incident, could be to place a significant load on the reactor vessel supports, which, in the extreme, could cause their failure. This, in turn, might damage the ECCS lines and/or prevent proper functioning of the control rods. This problem is particularly severe in PWRs. Applicant's response to this problem, a computer model of stresses at FSAR 3.9.1.4.6, is insufficient, and a full scale mechanical test is necessary, especially given the complexity of the reactor vessel geometry.

CONTENTION 9(c)

Steam generator tube integrity. In PWRs steam generator tube integrity is subject to diminution by corrosion, cracking, denting and fatigue cracks. This constitutes a hazard both during normal operation and under accident conditions. Primary loop stress corrosion cracks will, of course, lead to radioactivity leaks into the secondary loop and thereby out of the containment. A possible solution to this problem could involve redesign of the steam generator, but at FSAR, Section 10.3.5.3 the Applicant notes its intent to deal with this as a maintenance problem which may not be an adequate response given the instances noted in Contention 1, above.

CONTENTION 9(d)

Intervenors contend that there are many unresolved safety problems with clear health and safety implications and which are demonstrably applicable to the Byron Station design, but are not dealt with adequately in the FSAR. These issues include but are not limited to:

- d. Fracture toughness of steam generators and reactor coolant pump supports. The steel used as steam generator and reactor coolant pump support materials may be subject to cracks in the material near a weld under lower-than-normal temperature conditions. For this reason, under certain circumstances, auxiliary electric heating should, according to NRC generic problem analyses, be provided to keep the temperatures of these structural elements high enough to avoid brittle fracture. The problem may become severe under a LOCA condition. Auxiliary heating is not provided for in the Byron design, as indicated at FSAR 5.2.3.3 or 3.9.3.4.

CONTENTION 9(e)

Intervenors contend that there are many unresolved safety problems with clear health and safety implications and which are demonstrably applicable to the Byron Station design, but are not dealt with adequately in the FSAR. These issues include but are not limited to:

- e. The process of chemical decontamination may exacerbate safety problems through a degradation of the integrity of the primary coolant system boundary. Such degradation may occur during the process of decontamination or during subsequent operation of the reactor. Also, chemical solution decontamination may add to the deposition of radioactive

corrosive products, according to an NRC official. Decontamination is not discussed in Applicant's FSAR or EROL.