

STATE OF ILLINOIS
ILLINOIS COMMERCE COMMISSION

In the Matter of)

Commonwealth Edison Company)
Application to Halt Construction)
of Byron Nuclear Power Station,)
Units 1 and 2)

80-0760



AFFIDAVIT OF JAMES D. DERESS

My name is James D. Deress. I am employed by Commonwealth Edison Company as the Project Engineering Manager of the Byron and Braidwood Projects. I hold a B.S. in Mechanical Engineering from the Illinois Institute of Technology. I have been employed by Commonwealth Edison since 1941 and have held various positions in the construction, commercial and financial areas of the Company and, more recently, in the Station Nuclear Engineering Department and in its predecessor department, the Mechanical and Building Engineering Department.

In 1967, I became the Zion Project Engineer and was responsible for the review of the design and specifications for Zion Units 1 and 2 during their construction. In 1972, I became Section Engineer in charge of all pressurized water reactor plants in operation or under construction in the Commonwealth Edison system. This entailed supervisory responsibility for engineering and design of the Byron and Braidwood plants and for modifications on the Zion plant.

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In 1980, I attained my present position, Project Engineering Manager for Byron and Braidwood. I have supervisory control of the engineering work in progress and ensure that the plants will be safe, reliable and efficient, will satisfy industry codes and standards, will satisfy NRC regulations and licensing requirements and will satisfy contractual commitments and specifications. In addition, I maintain current knowledge of industry and regulatory developments which may affect the design of the Byron and Braidwood plants.

I have reviewed the "Affidavit of Richard B. Hubbard and Gregory C. Minor" (the "Affidavit") to determine whether and to what extent the Affidavit suggests the need for modifications to the Byron Station which are not currently included in the budget for that Station and which would likely be required to meet NRC or other regulatory requirements. Based on my review of the Affidavit, I conclude that no plant modifications involving significant capital expenditures additional to those already budgeted will be required to meet NRC safety requirements.

It is not possible to estimate with any reasonable degree of accuracy the need for potential design and equipment modifications at a nuclear power station without first carefully reviewing the design, specifications and capability of the equipment one proposes to modify. The design of the Byron Station is a joint effort of three large organizations with vast engineering expertise and experience. Commonwealth Edison Company supervises the overall design; Westinghouse

has designed the Nuclear Steam Supply System and much of the associated equipment; and Sargent & Lundy is the architect-engineer responsible for all balance-of-plant items. In order to design, fabricate, construct and analyze all of the various components which go into a nuclear power plant, it is necessary to marshall the technical expertise of many qualified individuals in at least all of the following areas: Nuclear Engineering, Mechanical Engineering, Structural Engineering, Materials Engineering, Environmental Engineering, Systems Engineering, Electrical Engineering, Instrument and Controls Engineering, Chemistry, Metallurgy, Seismology/Geology, Hydrology, Radiology, Health Physics and Thermodynamics. Any credible review of the adequacy of the design of a nuclear power facility would have to be done by persons qualified in all of these areas. The NRC, which reviews in detail the design of all nuclear power stations prior to authorizing their construction and again prior to authorizing their operation, has staff personnel and access to personnel within various National Laboratories and other federal agencies qualified in all of these areas. The analysis which Messrs. Hubbard and Minor report in their Affidavit does not appear to have been in any adequate depth at all. I say this because of the extremely superficial level of information regarding the design of the Byron Station reported in the Affidavit.

In reviewing the Affidavit, two significant deficiencies in the overall approach became immediately apparent.

I first noted that the discussion contained in the Affidavit regarding potentially expensive modifications to the Byron Station was not in fact based on a review of the Byron Station design or of the budget for future construction expenditures. Messrs. Hubbard and Minor appear to have conducted a review of various NRC generic documents which did not analyze the Byron Station specifically and developed very judgmental estimates of the cost of correcting certain design deficiencies if they existed. What Messrs. Hubbard and Minor have not done is determine whether these design deficiencies existed at the Byron Station. As I explain below, those design deficiencies identified in the Affidavit may exist at some other plant, but do not exist at the Byron Station, or to the extent modifications, if any, will be required, they will not require significant capital expenditures in excess of those already budgeted for the Station.

The second thing I noted was that it is impossible to trace from the discussion of particular design deficiencies to the cost estimates provided in Table 5.1-1 on page 80 of the Affidavit. The conclusion of the Affidavit, that large additional expenditures equivalent to "comparable increase in capital cost" ranging from a low of \$785 million to a high of \$2.119 billion, was developed from Table 5.1-1. I will, therefore, direct my comments to the Table primarily and only secondarily to the discussion contained in the text of the Affidavit. Specifically, I address the question of whether those costs which are actually claimed to represent

additional construction expenditures under the headings "Generic Issues" and "Safety Improvements" contained on Table 5.1-1 represent expenditures which may be required at the Byron Station.

The issues are addressed in the order that they appear in the Table.

A. Generic Issues

1. ATWS (Anticipated Transients Without Scram)

Nuclear power plants have safety and control systems that limit the consequences of abnormal operating conditions, so-called "anticipated transients." Some of these transients require the rapid shutdown ("scram") of the nuclear reactor in order to reduce the amount of heat generated in the reactor core. The failure of the reactor to scram following a transient is the event "Anticipated Transient Without Scram" or ATWS. The consequences of such an event, if not mitigated, could include core damage.

Analysis of ATWS events entails the use of computer codes that model core hydraulics, reactor coolant system hydraulics, nuclear core parameters, fuel rod temperature and neutron flux. There has been some disagreement surrounding the ATWS issue since 1973 when the NRC published WASH-1270 "Technical Report on Anticipated Transients Without Scram for Water-Cooled Power Reactors." The industry maintains that the probability of the event is much lower than that calculated by the NRC. Vendors and owners have

extensively analyzed the reactor protection systems with regard to common mode and random failures.

The Westinghouse plants, of which Byron is one, are recognized to be least susceptible to an ATWS event.^{1/} It does appear that the NRC will require additions to the plant protection features, though the additions are fewer and the cost much less for Westinghouse plants than for reactors manufactured by other vendors. In anticipation of such additions, Commonwealth Edison has conservatively budgeted \$1.2 million, which we expect will cover the costs associated with these modifications. It is impossible to tell from the Affidavit what, if any, capital expenditures Messrs. Hubbard and Minor propose as appropriate to modify the design or operating procedures to mitigate ATWS events.

2. Equipment Qualification

The issue of environmental qualification of Class 1E (safety-related) electrical equipment has been the subject of increased NRC attention over the past few years. The NRC Staff has required that nuclear plant owners develop qualification programs based on the requirements of IEEE-323-1971 or IEEE-323-1974. The Byron program is fairly well established, though actual testing is not completed. The program tests equipment to the following conditions, among others:

^{1/} NRC Staff document SECY-80-409 "Proposed Rulemaking to Amend 10 CFR Part 50 concerning Anticipated Transients Without Scram (ATWS) Events."

- a. Temperature and pressure conditions postulated to be present inside and outside the containment following a loss of coolant accident (LOCA) or a main steam line break (MSLB) accident;
- b. Containment conditions following chemical spray;
- c. Radiation conditions postulated to be present inside and outside the containment following a LOCA; and
- d. The effects of aging.

We have submitted the format of our program to the NRC, and we are awaiting a Staff response. There is currently \$3.5 million in the budget to cover the testing costs over and above testing costs that are included in the purchase price of specific equipment. We anticipate that this budget will be sufficient to meet the costs of equipment testing, and do not believe that the \$10 million figure suggested in the Affidavit is justified.

3. Steam Generators

The Steam Generator issue concerns the operational problems which have occurred in the Westinghouse designed, recirculation-type steam generators. These problems are outlined in the NRC document NUREG-0523 "Summary of Operating Experience with Recirculating Steam Generators" (January, 1979).

The types of operational problems experienced are:

1. Caustic stress corrosion and wastage;
2. Denting and U-bend cracking;

3. Tube support plate cracking; and
4. Anti-vibration for wear or fretting.

We originally addressed these problems in the design of our steam generators as is outlined in Section 5.4.2 of the Byron Final Safety Analysis Report (FSAR). The following design measures are intended to remedy the problem.

1. Inconel-600, a metal which has been shown to be highly resistant to corrosion, was chosen as the steam generator tube material;
2. Tubes are roll expanded to the full depth of the tube sheet to eliminate crevice areas in the tube sheet which can cause denting;
3. The adoption of all volatile treatment (AVT) chemistry to minimize tube wall thinning and denting;
4. State-of-the-art design, which has been substantiated by extensive analyses, to minimize mechanical and flow induced vibration;
5. A preheat section to evenly distribute flow and increase heat transfer; and
6. A separate auxiliary feedwater nozzle provided in the upper shell to avoid introducing cold water into the preheat section, thus avoiding adverse thermal effects.

In addition, it is Commonwealth Edison's practice to limit the use of copper in the secondary systems, thus eliminating the introduction of potentially reactive and,

therefore, corrosive copper ions into the water which flows past the steam generator tubes. This is accomplished by replacing the copper alloy, the heat exchange material more commonly used at other facilities, with stainless steel.

We are confident that the operational problems encountered by Westinghouse steam generators have been adequately addressed by the above design features. Our confidence is reinforced in view of our excellent experience with the Westinghouse steam generators at the Zion plant where AVT chemistry, sound operational procedures, cleaning methods and frequent inspection have prevented any significant steam generator tube degradation. The \$100 million additional cost for steam generator replacement quoted in the Hubbard-Minor Affidavit is a cost we do not expect to incur.

4. Fire Protection

Protection against damaging fires is incorporated throughout the design of the Byron Station. Fire Protection issues have been addressed in the FSAR for the Byron Station and again in our response to Appendix A of NRC Branch Technical Position APCSP 9.5-1, submitted to the NRC for review in October, 1977. This latter submission has yet to be reviewed by the NRC. However, the NRC has required the operating plants and plants that are close to obtaining an operating license to perform a Safe Shutdown Capability analysis in the event of a fire, and the same type of analyses.

will be done for the Byron Station in 1981. In significant part, the analyses contain the following elements:

1. Identification of the primary systems and support systems and components that are necessary for safe shutdown.
2. Identification of all equipment locations and determine which fire areas contain components and electrical cables necessary for safe shutdown.
3. Determination as to which fire areas contain components and electrical cables of redundant safe shutdown primary and support system and components.
4. Determination as to what modifications, if any, are necessary to ensure that all plant areas have one safe shutdown method independent of the area.

The analysis which will be performed with respect to the Byron Station is substantially similar to the analysis performed at the other nuclear stations on the Commonwealth Edison system. The modifications resulting from these other analyses, which have been incorporated into the Byron Station design, are approved by the NRC. We do not anticipate any major expenses associated with further modifications which may be required to address the Fire Protection issue.

5. Systems Interaction

As a result of a Westinghouse investigation into system interactions, four areas were identified where environmental conditions due to control system failures following a

high energy line break had the potential to adversely affect the performance of safety systems. The four scenarios were reported to the NRC and an IE Information Notice was issued to all utilities to investigate control failures. We reviewed the four scenarios and performed the evaluations necessary to predict the effect on safety-related systems. Our conclusion was that no modifications were required.

Additional systems interaction evaluations may be required. The Zion plant, which is similar to the Byron Station, has performed such a study, and the modifications that resulted were minor. We do not anticipate that any additional system interaction study will show a need for significant additional expenditures.

6. Three Mile Island Issues

The requirements resulting from the Three Mile Island incident have been fairly well defined by the NRC documents NUREG-0578, NUREG-0660 and NUREG-0737. There are still some elements that are under discussion, such as siting and shielding requirements for the Emergency Operations Facility and qualification requirements of instrumentation. Based on the published requirements and allowing for some uncertainties, the Byron Station budget was increased by \$75 million to cover the anticipated cost associated with Three Mile Island-induced modifications. Some of the major items in the budget consideration were:

1. The addition of a reactor vessel level measurement system

2. Construction of a Technical Support Center
3. Modification of the post-accident sampling system
4. Plant shielding review and plant modifications.

The testimony and exhibits which Mr. Byron Lee, Jr., filed in Docket No. 78-0646 addressed the Three Mile Island issues and related budget modifications in detail. As previously stated, Edison has budgeted \$75 million for such modifications. The Hubbard-Minor Affidavit states that the expense associated with Three Mile Island modifications will total \$30-50 million. Although I consider the Edison estimate more realistic, whichever estimate is correct, the Byron budget will not have to be adjusted upwards.

B. Safety Issues

The two items listed in this portion of Table 5.1-1 overlap and are both encompassed within the concept of Class 9 modification. Messrs. Hubbard and Minor discuss all of these issues as if they are totally independent, indicating that they do not fully understand the issues. The five research programs^{2/} described on page 69 of the Affidavit are specifically aimed towards mitigation or prevention of a

^{2/} Although the Table refers to the "Fire Research Programs," I am assuming that the authors of the Affidavit actually intended this category to refer to the "Five Research Programs." This assumption is consistent with the discussion at page 69 of the Affidavit referring to the five research projects undertaken by the NRC and the fact that the Table includes "Fire" as one of the sub-categories under "Generic Issues."

core melt type Class 9 accident, and the discussion of Class 9 accident requirements includes the concepts of those research programs. The NRC has recently issued an Advanced Notice of Proposed Rulemaking (45 F.R. 65474) to "determine to what extent . . . nuclear power plants should be able to cope with reactor accidents beyond those considered in the current 'design basis accident' approach." The Notice lists a series of 18 questions to be considered by the industry.

The issues dealt with in this proposed rulemaking cover, in part, the following:

- a. Additional decay heat removal systems
- b. Hydrogen control
- c. Core retention system
- d. Engineered safety system failure to operate
- e. Controlled filter venting of the containment
- f. Operator training and procedures
- g. Design, quality and seismic criteria
- h. The use of probabilistic analysis

Commonwealth Edison is involved in preparing a probabilistic risk assessment study for the Zion plant. The analysis incorporates, in part, the following elements:

1. Component and system analysis and interaction;
2. Analysis of core melt phenomena and resultant radioactive material release;
3. Structural analysis of containment features;
4. Release radioactive plume analysis;

5. Calculation and application of probability numbers with a resultant probability of release; and
6. Detailed seismic analysis of the plant structures.

Based on preliminary results from this study, it appears that major equipment modifications or additions are not required to prevent or mitigate a core melt accident.

In summary, it is my opinion that the cost estimates presented in that portion of the Hubbard/Minor Affidavit under the heading "Outstanding Safety Issues," and summarized under the headings "Generic Issues" and "Safety Improvements" on Table 5.1-1, were not based on any review of the specific design of the Byron Station. The detailed design of the Byron Station has progressed significantly over the course of its construction, and the Company has carefully monitored developing NRC licensing requirements. In my opinion, the current total budget for the Byron Station will not increase by any significant amount due to additional design modifications or equipment additions.

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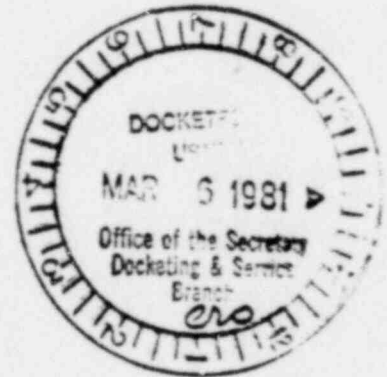
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AFFIDAVIT OF JAMES D. DERESS

STATE OF ILLINOIS)
) SS.
COUNTY OF COOK)



I, James D. Deress, being first duly sworn on oath
state that I have prepared the attached Affidavit of James D.
Deress and that the statements contained therein are true and
correct to the best of my information, knowledge and belief.

James D. Deress
James D. Deress

SUBSCRIBED AND SWORN TO before me
this 19th day of December, 1980.

James D. Deress
Notary Public

My Commission expires: 12/19/81