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)	)	

AFFIDAVIT OF EDWARD M. BURNS

The attached answers to the questions posed by counsel constitute my testimony in the above-captioned proceeding. The testimony is true and accurate to the best of my knowledge, information and belief.

Edward M. Burns

Subscribed and sworn to
before me this 19 day
of July, 1982.

Notary Public

AFFIDAVIT OF EDWARD M. BURNS

CONCERNING DAARE/SAFE

CONTENTION 9c.

Q.1. State your name and occupation.

A.1. My name is Edward M. Burns. My business address is Westinghouse Electric Corporation, P.O. Box 355, Pittsburgh, PA 15230. I am a Senior Engineer in the Nuclear Safety Department, Nuclear Technology Division, Westinghouse Electric Corporation.

Q.2. State your educational background and professional work experience.

A.2. From 1967 through 1971, I attended Milwaukee School of Engineering and received a Bachelor of Science Degree in Mechanical Engineering. Following graduation I entered the United States Army and served as an enlisted man, Lieutenant and Captain at several locations within the United States and Europe. From March 1977 to August 1979, I served with the United States Army Armor and Engineer Board as a project officer responsible for the planning, conduct, analysis and reporting of operational tests of ground mobility equipment and ordinance.

I enrolled in 1977 in the University of Southern California night school program and received in March 1979 a Master of Science in Research and Development Systems Management. Upon leaving the Army in September 1979, I attended the University of Wisconsin and received a Master of Science Degree in Nuclear Engineering in December 1980. Additionally, from May to December 1980, I worked as an assistant to the head of the University of Wisconsin Fusion Studies program. In this capacity, I was responsible for coordinating parametric studies input for a conceptual heavy ion beam fusion reactor.

Following graduation in 1980, I was employed by Westinghouse Electric Corporation in the Nuclear Safety Department. I have since been responsible for evaluating the compliance of fluid systems and components with applicable safety and design criteria. In this capacity, I have reviewed the implementation of safety grade cold shutdown design improvements for several domestic and foreign nuclear power plants. Additionally, I have conducted safety evaluations for pumps,

valves and heat exchangers within the reactor coolant and auxiliary systems. Recently I have coordinated and prepared the safety evaluation for the feedwater system modifications implemented in the KRSKO nuclear power plant.

I am a member of the American Society of Mechanical Engineers, the American Nuclear Society and the Association of the United States Army.

Q.3. What is the purpose of your affidavit?

A.3. My affidavit addresses DAARE/SAFE Contention 9c. insofar as that contention concerns the flow induced vibration and tube wear in the preheater section of Westinghouse model D steam generators. My testimony supplements the testimony of Dr. Jai Raj N. Rajan of the NRC Staff. Dr. Rajan's testimony was submitted as part of a joint affidavit in support of the Staff's June 7 motion for summary disposition.

Q.4. What is the "flow induced vibration and tube wear" phenomenon mentioned in your testimony?

A.4. Indications of tube wear have been observed in steam generators of Westinghouse-designed nuclear

power plants. These indications have occurred in tubes contained within the preheater region of model D steam generators. From data gathered to date, it appears that this tube wear is caused by tube vibrations brought about by either a fluid elastic mechanism, turbulence, or a combination of the two.

Q.5. Could the "flow induced vibration" phenomenon affect the steam generators for the Byron Station?

A.5. The steam generators at Byron Unit 1 are model D4 while those at Byron Unit 2 are model D5. These steam generators are of the counterflow design versus the split flow design present in model D2 and D3 steam generators.

To date, only one nuclear power plant with model D4 steam generators has conducted power operations. This is the KRSKO plant located in Yugoslavia. No power plant with model D5 steam generators has yet operated. Other power plants with model D steam generators that have conducted power operations are: Ringhals 3 (model D3), Almarez 1 (model D3), McGuire 1 (model D2), and Angra (model D3).

Data gathered from these operating plants indicates that tube vibration for the model D4 is less than that of the model D2 and D3. For the model D4, the onset of significant tube vibration appears to occur at feedwater flow rates into the main feedwater nozzle in excess of 70 percent of full power flow. This may be compared with that of models D2 and D3 where the onset of significant tube vibration appears to occur between 50 and 60 percent of full power flow.

Since the steam generators at Byron Units 1 and 2 are of similar design as those at KRSKO, tube vibration could also occur at Byron. Tube wear, however, is noticeably less at KRSKO for equivalent operating periods and power levels than in the D3 operating plants. Inspection of a pulled tube from KRSKO indicates only minor onset of surface wear.

Q.6. Is Westinghouse taking action to evaluate this issue?

A.6. Westinghouse is presently evaluating the tube vibration phenomenon through an extensive analysis

and test program in conjunction with applicable utilities. This test program involves gathering and analyzing operating plant data and data obtained from scale model tests.

Q.7. Please describe the test program.

A.7. The model D4/D5 test program focuses on understanding preheater tube vibration through identifying the cause and any necessary corrective modifications. An air model is being used to determine flow velocity distributions in the preheater. A quarter scale model will verify this data in water. A tube vibration model is being used to characterize tube response under various excitation conditions. A sixteen degree partial full scale model will be utilized to confirm the extent of tube vibration and evaluate the effectiveness of candidate modifications.

Q.8. What is the present status of the test program?

A.8. The air model, tube vibration model, and tests of modification concepts are currently being conducted. The quarter scale model is expected

to undergo initial tests in August 1982 while the sixteen degree model tests should be initiated in early September 1982.

Q.9. Is Westinghouse considering any design modifications to the model D steam generators?

A.9. Yes. Several design modifications are undergoing review as possible solutions for the tube vibration issue. Proposed modifications for models D4 and D5 include 1) the addition of impingement plate ribs with flow slots, 2) the addition of a flow diverter, 3) the addition of a center channel flow restrictor, 4) expansion of tubes at the support plates, 5) sleeving tubes, 6) bypassing some flow through a baffle plate and/or the inlet box cap plate, 7) modification of the inlet nozzle flow limiter, 8) flow distribution devices in the inlet passes, and 9) systems modifications which divert a portion on the feedwater to the bypass line. Combinations of these concepts are also being considered.

Q.10. Will a design modification for the steam generators at the Byron Station be necessary?

A.10. Some level of design modification may be necessary for the Byron Station steam generators to permit long-term operation at full power.

Q.11. When will Westinghouse's consideration of the tube vibration issue be completed?

A.11. A Westinghouse in-depth review is presently estimated to occur during January 1983. During this review, the extent of the tube vibration issue for the model D4 and D5 steam generators will be characterized, and if required, a design modification or modifications will be reviewed for detailed design and implementation in the Byron Station. This in-depth review process may be expected to take from 4 to 6 weeks. The current objective is to be in a position to identify a modification, if such proves to be required, by early in 1983.

Q.12. Will the results of the Westinghouse review be submitted to the NRC Staff for its review?

A.12. Yes, following completion of the review, the course of action will be presented to the NRC Staff for their review and concurrence.

Q.13. Assuming one is needed, how long will it take to implement a design modification at the Byron Station?

A.13. I cannot give a precise schedule at this time. However, based on my understanding of the modifications being considered, I estimate it would take from a few weeks to two or three months to complete the work.