

August 17, 1977

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Docket

Docket No. 50-281

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Virginia Electric & Power Company  
ATTN: Mr. W. L. Proffitt  
Senior Vice President - Power  
P. O. Box 26666  
Richmond, Virginia 23261

*B.D. Liaw*

Gentlemen:

Enclosed is a signed original of an Order for Modification of License, dated August , 1977, issued by the Commission for the Surry Power Station Unit No. 2. This Order amends Facility Operating License No. DPR-37 permitting continued operation of Surry Unit No. 2 to September 15, 1977, and relates to the steam generator repair program license condition of the NRC Order for Modification of License dated April 1, 1977. Appendix A-1 to the license, issued April 1, 1977, is being continued in order to implement the restrictions of Ordered License Condition 3.E.(4) regarding reactor coolant activity.

A copy of the related Safety Evaluation is also enclosed. The Order is being filed with the Office of the Federal Register for publication.

Sincerely,

Robert W. Reid, Chief  
Operating Reactors Branch #4  
Division of Operating Reactors

Enclosures:

- Order for Modification of License
- Safety Evaluation

cc w/enclosures:  
See next page

*Deal with amount promised to M F 8/17/77*

*Construct B2*

AD-OR:DOR  
DEisenhut  
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AD-OR:DOR  
KRGoller  
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OFFICE	ORB#4:DOR	ORB#4:DOR	OELD	C-ORB#4:DOR	DOR	NRR
SURNAME	Ringram	MFairtile:dn		RWReid	VStello	EGCase
DATE	8/17/77	8/17/77	8/17/77	8/17/77	8/17/77	8/17/77

Virginia Electric & Power Company

cc w/enclosure(s):  
Michael W. Maupin, Esq.  
Hunton, Williams, Gay & Gibson  
P. O. Box 1535  
Richmond, Virginia 23213

Swem Library  
College of William & Mary  
Williamsburg, Virginia 23185

Mr. Sherlock Holmes, Chairman  
Board of Supervisors of Surry County  
Surry County Courthouse  
Surry, Virginia 23683

Chief, Energy Systems  
Analyses Branch (AW-459)  
Office of Radiation Programs  
U. S. Environmental Protection Agency  
Room 645, East Tower  
401 M Street, S.W.  
Washington, D.C. 20460

U. S. Environmental Protection Agency  
Region III Office  
ATTN: EIS COORDINATOR  
Curtis Building (Sixth Floor)  
6th and Walnut Streets  
Philadelphia, Pennsylvania 19106

Mr. James C. Dunstan  
State Corporation Commission  
Commonwealth of Virginia  
Blandon Building  
Richmond, Virginia 23209

cc w/enclosures and incoming  
dtd: 7/29 & 8/9/77  
Commonwealth of Virginia  
Council on the Environment  
903 9th Street Office Building  
Richmond, Virginia 23219



the resulting shutdown will include performance of the required inspection. The NRC staff has evaluated the results of the previous inspection program and has assessed continued safe operation of the facility. This evaluation is set forth in the staff's concurrently issued Safety Evaluation relating to steam generator tube integrity.

With respect to the effect of increased stress in the tube support plate as a result of tube support plate growth, the staff, in their April 1, 1977 Safety Evaluation (SE), concluded that neither buckling of the tube support plate nor damage to the steam generator shell through the wrapper and channel spacer would develop.

Continued growth of the tube support plate continues to impose stresses on the tubes and may result in the development of stress corrosion cracks in denting locations. The staff has considered the effect of the development of stress corrosion cracking during the course of operation of this facility, and has assessed the effect of such cracks in conjunction with steam line break and loss of coolant accident events. The staff has concluded that under the limitations on tube leakage set forth in this Order, the effect of continued denting on the consequences of the steam line break event would be a fraction of Part 100, and the effect on continued denting on LOCA events, as stated in the April 1, 1977 SE, would not be significant. These events are of extremely low

probability, and would be especially so for the limited period of approximately 29 days covered by this Order. The limitations set forth in this Order will provide reasonable assurance that the public health and safety will not be endangered.

After discussion with the staff the licensee has proposed in his July 29, 1977, submittal to continue the limitations applicable to this facility in the manner set forth in the April 1, 1977 Order. The NRC staff believes that the licensee's actions, under the circumstances are appropriate and should be confirmed by NRC order.

Copies of the following documents are available for public inspection in the Commission's Public Document Room, 1717 H Street, N.W., Washington, D. C., 20555 and at the Swem Library, College of William and Mary, Williamsburg, Virginia, (1) Licensee's submittals of July 29, 1977 and August 9, 1977, (2) Order for Modification of License dated April 1, 1977, (3) this Order for Modification of License, In the Matter of Virginia Electric and Power Company, Surry Power Station, Unit No. 2, Docket No. 50-281, and (4) the Commission's concurrently issued Safety Evaluation supporting this Order\*/.

\*/ A copy of items (2), (3), and (4) may be obtained upon request addressed to the U. S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Director, Division of Operating Reactors.

III.

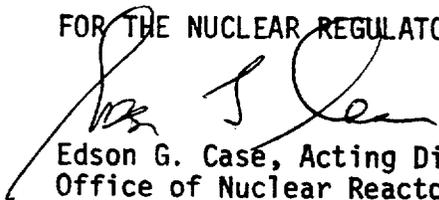
Accordingly, pursuant to the Atomic Energy Act of 1954, as amended, and the Commission's Rules and Regulations in 10 CFR Parts 2 and 50, IT IS ORDERED THAT Facility Operating License No. DPR-37 is hereby amended by replacing in its entirety existing paragraph 3.E. of the license with the following:

E. Steam Generator Inspection

- (1) Unit No. 2 shall be brought to the cold shutdown condition by midnight, September 15, 1977 in order to perform an inspection of the steam generators. Nuclear Regulatory Commission approval shall be obtained before resuming power operation following this inspection.
- (2) Primary coolant leakage from the primary system to the secondary system through the steam generator tubes shall be limited to 1.0 gpm for all three steam generators and shall be limited to 0.3 gpm per steam generator, as described in the NRC Safety Evaluation of April 1, 1977. With any steam generator tube leakage greater than either limit the reactor shall be brought to the cold shutdown condition within 24 hours. Nuclear Regulatory Commission approval shall be obtained before resuming reactor operation.

- (3) Reactor operation will be terminated if primary to secondary leakage which is attributable to 2 or more tubes occurs during a 20 day period. Nuclear Regulatory Commission approval shall be obtained before resuming reactor operation.
- (4) The concentration of radioiodine in the primary coolant shall be limited to 1  $\mu\text{Ci}/\text{gram}$  during normal operation and to 10  $\mu\text{Ci}/\text{gram}$  during power transients as defined in Appendix A-1 to the Technical Specifications of the license. Appendix A-1 was issued with the April 1, 1977 Order and shall remain in effect through midnight September 15, 1977.

FOR THE NUCLEAR REGULATORY COMMISSION



Edson G. Case, Acting Director  
Office of Nuclear Reactor Regulation

Dated in Bethesda, Maryland  
this 17th day of August 1977.



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING ORDER FOR MODIFICATION OF LICENSE

VIRGINIA ELECTRIC AND POWER COMPANY

SURRY POWER STATION UNIT NO. 2

DOCKET NO. 50-281

By letter dated July 29, 1977, Virginia Electric and Power Company (VEPCO) requested NRC's approval for continued operation of Surry Unit No. 2 until September 15, 1977. The requested period of operation is an extension for approximately one month beyond the four (4) months approved in the NRC Order of April 1, 1977. The basis for determining the four month period of operation was the preventive tube plugging criteria that VEPCO implemented after the inspection of the steam generators and prior to the restart of Unit No. 2. The criterion for preventive tube plugging was determined from the predicted growth of regions in the tube support plate in which the severity of tube denting would be susceptible to stress corrosion cracking. Specifically, the rate of growth of these regions was one half tube spacing per month of equivalent power operation. The results of an inspection performed during the unscheduled shutdown following a tube leak incident in July 1977 confirmed that the plugging criteria cited above resulted in a reasonable approximation of the pattern of predictive growths of tube denting and tube support plate strain, and provides substantial protection, when coupled with the limitations on leakage under which the plant operates; See Safety Evaluation dated July 20, 1977. Therefore, an additional one month of operation should not result in a significant number of additional tubes becoming severely dented and susceptible to stress corrosion cracking. The effect of continued denting on Loss-of-Coolant Accident events, as stated in the April 1, 1977 Safety Evaluation, would not be significant.

In the event that uneven growths of the regions (i.e., in which tube cracking was expected) were to occur due to the partial cracks of the support plate, some tubes could be dented further during the extra month of operation and become susceptible to stress corrosion cracking. If the crack penetrates through wall, it will cause detectable leaks during normal operation. If the leak rate reaches 0.3 GPM, the reactor will be brought to the cold shutdown condition; therefore, crack penetration during normal operation has no severe safety consequence. However, if a number of tubes were to crack partially through wall; e.g., 85% to 100% of the wall thickness, these tubes will probably

crack through and leak during a postulated main steam line break (MSLB) accident. In this respect, the licensee has estimated that the total primary to secondary leakage rate in the affected steam generator will not exceed ten (10) GPM.

By letter dated August 9, 1977, the licensee has also presented an evaluation of the effect of primary to secondary coolant flow during a postulated main steam line break for Surry Unit No. 2. The evaluation is based upon a leak rate of 10 GPM concurrent with a main steam line break accident. The analysis provided in the Final Safety Analysis Report for the Surry plant indicated that the core transient is terminated within 90 seconds after the break. Loss of 10 to 15 gallons of primary coolant, approximately 0.02% of the primary coolant volume, would have a negligible effect on the primary system thermal hydraulic parameters.

#### Conclusion

The NRC staff has reviewed the basis upon which the licensee estimated the total primary to secondary leakage rate of no more than ten (10) GPM in the affected steam generator during a MSLB accident, and the effect of the leak rate concurrent with the accident, and concluded the following:

- (1) The type of cracks associated with tube denting are tightly held closed by the support plate, and will not burst open during a MSLB accident.
- (2) The leak rate associated with these cracks is very small, and the degree of degradation that can develop during the period until September 15, 1977, is limited by the stringent leakage limitations under which the plant operates.
- (3) On this basis, the estimated 10 GPM leak rate is appropriate to use in assessing the potential effect of leakage during MSLB and LOCA conditions.
- (4) A primary to secondary leak rate of 10 GPM will not affect the departure from nucleate boiling ratio during a postulated main steam line break accident.
- (5) The proposed additional period of operation of Surry Unit No. 2 until the planned September refueling outage is therefore acceptable.

We have concluded, based on the considerations discussed above, that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations and the modification of the April 1, 1977 Order will not be inimical to the common defense and security or to the health and safety of the public. However, this conclusion is only applicable for operation to September 15, 1977.

Dated: August 17, 1977