

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
UNITED STATES ATOMIC ENERGY COMMISSION  
WASHINGTON, D.C. 20545

March 13, 1973

Honorable Dixy Lee Ray  
Chairman  
U. S. Atomic Energy Commission  
Washington, D. C. 20545

Subject: REPORT ON NORTH ANNA POWER STATION, UNITS NO. 3 AND NO. 4

Dear Dr. Ray:

At its 155th meeting, March 8-10, 1973, the Advisory Committee on Reactor Safeguards completed its review of the application of the Virginia Electric and Power Company for authorization to construct two nuclear units, identified as the North Anna Power Station, Units No. 3 and No. 4, in Louisa County, Virginia. This project was considered at a Subcommittee meeting at the site on December 22, 1972, at a Subcommittee meeting on January 3, 1973, in Washington, D. C., at the 153rd meeting of the Committee, January 11-13, 1973, in Washington, D. C., and at a Subcommittee meeting on February 23, 1973, in Washington, D. C. During its review, the Committee had the benefit of discussions with representatives and consultants of the Virginia Electric and Power Company, the Babcock & Wilcox Company, the Stone and Webster Engineering Corporation, and the AEC Regulatory Staff. The Committee also had the benefit of the documents listed.

The North Anna Power Station site consists of 1,075 acres of land in the northeastern corner of Louisa County, Virginia, on the south shore of Lake Anna, a 17 mile long, 13,000 acre man-made lake created by impoundment of water in the North Anna River. Units No. 3 and No. 4 share the site with Nuclear Units No. 1 and No. 2, which are now under construction. The nearest population center is Fredericksburg, about 24 miles northeast of the site, with a population of approximately 15,000 in 1970. The minimum exclusion distance is 5,000 feet. The low population zone, extending six miles from the site, had a 1970 population of approximately 2000. The site is in a rural, extensively wooded, area which is interspersed with farms.

Each of the two proposed nuclear steam supply systems will utilize a two-loop pressurized water reactor supplied by the Babcock & Wilcox Company and designed to operate at an initial power of 2,631 MWt. The thermal power level and the design of the nuclear steam supply

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systems for the North Anna Units No. 3 and No. 4 are generally similar to those of the Davis-Besse Nuclear Power Station. However, the average and maximum linear power ratings are, respectively, about 22 percent and 8 percent higher for North Anna Units No. 3 and No. 4. The Committee reiterates its previous statements with respect to reactors designed for high linear power ratings that, if experience does not confirm the predicted performance, system modifications or restrictions on operations may be appropriate.

Because of the importance of the incore instrumentation for operation of this plant, the Committee urges that careful attention be given to ensuring reliability and adequacy of the incore system. Experience with performance of similar systems in the Oconee Nuclear Station should be thoroughly examined to make certain that the information needed can be obtained with the accuracy required. The applicant stated that the reactor design does not preclude the capability of installing traveling incore instrumentation. The Committee recommends that this flexibility be retained.

The applicant is reviewing the calculated performance of the emergency core cooling system following a postulated loss-of-coolant accident resulting from a break in a core flooding tank line. He has agreed to make such system changes as are determined to be necessary.

The potential effects of fuel performance and LOCA-related phenomena for the possible spectrum of break sizes on acceptable linear power ratings for the North Anna Units No. 3 and No. 4 require further study. In addition, the Committee believes it important that improvements in ECCS effectiveness be investigated and included, as practical. The Committee recommends that the final design of the ECCS be reviewed by the Regulatory Staff and the ACRS prior to fabrication and installation of major components.

The applicant has under study means to mitigate the consequences of possible rupture of the main steam lines and feedwater lines outside the containment building. This matter should be resolved to the satisfaction of the Regulatory Staff; the Committee wishes to be kept informed.

The applicant has indicated that the design of the reactor vessel and internals will have the benefit of experience obtained in the Oconee Nuclear Power Station Unit No. 1 as well as other Babcock & Wilcox data. The applicant will perform a prototype-plant vibration test program on the North Anna Unit No. 3. The Committee wishes to emphasize the desirability of using the available technology to monitor for excessive vibrations, loose parts, or other anomalous effects in the primary system during operation.

The Committee believes it desirable for the applicant and the Regulatory Staff to review further North Anna Power Station Units No. 3 and No. 4 for design features that should reduce the possibility and consequences of sabotage, in accordance with Safety Guide No. 17, "Protection Against Industrial Sabotage."

The applicant is reviewing the quality group classification of portions of the component cooling system relative to Safety Guide 26, "Quality Group Classifications and Standards." This matter should be resolved in a manner satisfactory to the Regulatory Staff.

The Regulatory Staff is reviewing the pressure margins used by the applicant in the design of containment sub-compartments to withstand the effects of pressure transients. This matter should be resolved in a manner satisfactory to the Regulatory Staff.

A review of the proposed environmental surveillance program revealed several unresolved questions with respect to sample collection and analysis, particularly as to the usefulness of the resulting data for estimating population dose. This matter should be resolved in a manner satisfactory to the Regulatory Staff.

Studies are in progress relating to the effects of a failure to scram during anticipated transients and of design features which would make tolerable the results of such an event. These studies should be expedited and the matter resolved during construction in a manner satisfactory to the Regulatory Staff and the ACRS.

The Committee believes that, unless the applicant can demonstrate that the probability of a serious accident arising from turbine missile generation is acceptably low, further measures both to reduce the probability and the potential consequences of turbine missile generation, including considerations of overspeed, be studied and implemented. Analytical and experimental work on the penetration of reinforced concrete by missiles of the type of interest is an example of the kinds of data important to evaluation of this problem.

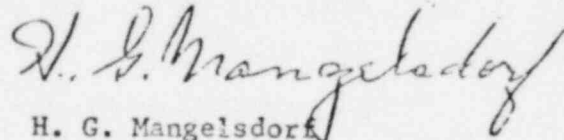
Other problems relating to large water reactors, which have been identified by the Regulatory Staff and the ACRS and cited in previous reports, should be dealt with appropriately by the Regulatory Staff and the applicant as suitable approaches are developed.

The Advisory Committee on Reactor Safeguards believes that the items mentioned above can be resolved during construction and that, if due

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consideration is given to the foregoing, the North Anna Power Station, Units No. 3 and No. 4 can be constructed with reasonable assurance that they can be operated without undue risk to the health and safety of the public.

Sincerely yours,



H. G. Mangelsdorf  
Chairman

References:

- 1) Virginia Electric and Power Company Application for License to Construct and Operate North Anna Power Station, Units No. 3 and No. 4, with Volumes 1 through 4, Preliminary Safety Analysis Report, and Volumes I and II, Supplementary Preliminary Safety Analysis Report
- 2) Amendments 1 through 15 to the Application
- 3) Virginia Electric and Power Company letter to DL dated December 27, 1972 re: General Information Required for Consideration of the Effects of a Piping-System Break Outside Containment
- 4) Virginia Electric and Power Company letter to DL dated December 27, 1972 re: construction permits for North Anna Units No. 3 and No. 4
- 5) Virginia Electric and Power Company letter dated December 29, 1972 furnishing information regarding the Safety Evaluation Position on the service water reservoir for North Anna Units No. 3 and No. 4
- 6) DL Safety Evaluation, received December 29, 1972
- 7) Virginia Electric and Power Company letter to DL dated January 2, 1973 re: analysis of the effects of fuel densification
- 8) Virginia Electric and Power Company letter to DL dated January 10, 1973 re: Safety Evaluation Position concerning application for a construction permit
- 9) Virginia Electric and Power Company letter dated January 16, 1973 re: exemption request
- 10) Virginia Electric and Power Company letter dated January 23, 1973 re: report entitled, "Mixing of Combustible Gases in the Containment Subcompartments Following a LOCA for North Anna Units No. 3 and No. 4

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References (Cont'd):

- 11) Virginia Electric and Power Company letter dated January 25, 1973 to DL re: function of active valves under normal system operation
- 12) Virginia Electric And Power Company letter to DL dated February 2, 1973 re: report entitled "Radioiodine Releases"
- 13) Virginia Electric and Power Company letter dated February 9, 1973 to DL furnishing information regarding turbine rotor and disc inspection at the North Anna No. 3 and No. 4
- 14) Virginia Electric and Power Company letter to DL dated February 16, 1973 re: application for construction permits for North Anna No. 3 and No. 4
- 15) Virginia Electric and Power Company letter dated February 16, 1973 to DL re: additional information on the construction permits
- 16) Virginia Electric and Power Company letter dated February 16, 1973 to DL re: additional information on the construction permits
- 17) Virginia Electric and Power Company letter dated February 21, 1973 to DL re: intentions and conditions which must be met in the application for construction permits
- 18) DL Supplement No. 1 to the Safety Evaluation dated February 21, 1973
- 19) Virginia Electric and Power Company letter dated March 7, 1973 re: radioiodine releases and the service water system at North Anna No. 3 and No. 4