

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

August 20, 1970

Honorable Glenn T. Seaborg
Chairman
U. S. Atomic Energy Commission
Washington, D. C. 20545

Subject: REPORT ON NORTH ANNA POWER STATION UNITS 1 AND 2

Dear Dr. Seaborg:

At its 124th meeting, August 13-15, 1970 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 at its North Anna Power Station in Louisa County, Virginia. This project was considered at a Subcommittee meeting in Fredericksburg, Virginia on July 30, 1970 which included an inspection of the site. During its review, the Committee had the benefit of discussions with representatives of the Virginia Electric and Power Company, the Westinghouse Electric Corporation, the Stone and Webster Engineering Corporation, the AEC Regulatory Staff and their consultants. The Committee also had the benefit of the documents listed.

The North Anna Power Station site comprises approximately 1075 acres located in the northeastern corner of Louisa County, Virginia adjacent to and south of the North Anna River. The nearest population center is Fredericksburg, Virginia, about 24 miles northeast of the site, with a population of approximately 15,000, in 1968. The low population zone, extending six miles from the site had a 1968 population of about 2,000. The minimum exclusion distance is about 0.84 miles. The region surrounding the site is rural and sparsely populated.

Each of the North Anna nuclear units will include a three-loop pressurized water reactor designed for an initial core power level of 2652 MWt. The nuclear steam supply systems and the emergency core cooling systems are essentially identical with those for the previously reviewed Surry Power Station Units 1 and 2 and Beaver Valley Power Station Unit 1 (ACRS reports of April 29, 1968 and March 12, 1970 respectively). The proposed power level and average power density are essentially the same as for Beaver Valley Unit 1. If measurements to be made in Beaver Valley or similar operating cores should not adequately confirm the basis for estimates of hot channel conditions used in the North Anna design, system modifications or restrictions on operations may be appropriate.

POOR
ORIGINAL

8002.200 949

August 20, 1970

The subatmospheric containment systems are similar to those approved for the Surry Power Station Units 1 and 2. In the unlikely event of a loss-of-coolant accident, the pressure in the containment is quickly reduced to below atmospheric by operation of redundant containment spray systems which initially introduce chilled water and then cooled, recirculated water from the containment sump into the containment atmosphere. The spray systems thus provide the heat sink for steam condensation and pressure reduction in the containment. The applicant proposes to flow-test this system only once (during pre-operational testing), to maintain the system in a dry condition thereafter, and to perform periodic rotational tests and cable insulation tests to determine that the powered pumps will rotate. The Committee believes that these tests provide insufficient assurance that the vital containment spray systems will perform as designed. Provisions for appropriate periodic flow-testing of the containment spray systems should be incorporated into the design. This matter should be resolved during construction in a manner satisfactory to the Regulatory Staff. The Regulatory Staff should also review the containment design pressure to assure that an adequate margin of conservatism exists.

Cooling water for the North Anna reactors is supplied from a 13,000 acre reservoir formed by the construction of a dam across the North Anna River about five miles below the station site. Cooling water for both normal and emergency shutdown conditions is supplied by a separate seismic Class I Service Water Reservoir with makeup supplied from the North Anna Reservoir. The Committee believes that a second Class I source of emergency cooling water or its equivalent should be provided.

Cooling water and liquid wastes will be discharged into a series of three lagoons which flow into the North Anna Reservoir. Because of extended periods of low flow of the North Anna River, cooling water will be recirculated with a resulting potential buildup of long-lived radioisotopes in the reservoir. The concentrations are estimated to reach about 40 percent of those in the discharge canal. While the radioactivity concentrations expected in the canal are estimated by the applicant to be a small fraction of the 10 CFR 20 limits, limited dilution and the seasonally exposed near-shore lake bottom may tend to create an unsatisfactory external radiation exposure situation. Reconcentration factors and radiation exposure rates should be estimated for critical radioisotopes, such as cesium, and this information used in the design of the waste treatment system.

The applicant has described his procedures for changeover from normal operation to operation with one circulating loop out of service. The procedures involve reducing power to 50%, manually adjusting several set points on the control room instrumentation and checking the instruments to confirm the proper setting. Power is then raised to 60% of

POOR
ORIGINAL

full power for continued operation. The required manual adjustments should be minimal, made in accordance with explicit procedures by approved personnel, on a deliberate time scale, and with final settings calibrated and tested. It is expected that this mode of operation will be infrequent. The Committee believes that these conditions are essential if manual rather than automatic adjustment of set points is to be used for removing a loop from service at power.

The applicant stated that he will install equipment to control the buildup of hydrogen in the containment which might follow in the unlikely event of a loss-of-coolant accident. Consideration is being given to a catalytic recombiner presently under development for limiting hydrogen concentration. The hydrogen control system and provisions for containment atmosphere mixing and sampling should have redundancy and instrumentation suitable for an engineered safety feature. The capability for controlled purging should also be provided. The Committee wishes to be kept informed of the resolution of this matter.

The applicant should study design changes to improve the capability for testing the actuating circuits for the engineered safety features during reactor operation.

The Committee recommends that the applicant accelerate the study of means to prevent common mode failures from negating scram action and of design features to make tolerable the consequences of failure to scram during anticipated transients. The applicant stated that the engineering design would maintain flexibility with regard to relief capacity of the primary system and to diverse means of reducing reactivity. This matter should be resolved in a manner satisfactory to the Regulatory Staff during construction; the Committee wishes to be kept informed.

The applicant's criteria for design of the irradiated-fuel-storage pool include the provision that adequate cooling water be available in the event of postulated accidents involving large missiles or a dropped fuel cask. The specific design approach adopted and related analyses should be reviewed by the Regulatory Staff.

The Committee reiterates its interest in active participation by applicants in overall quality assurance programs to better assure the construction of safe plants. In this regard, an increased level of direct participation by the applicant in the quality assurance program of the North Anna Station would be desirable.

POOR
ORIGINAL

August 20, 1970

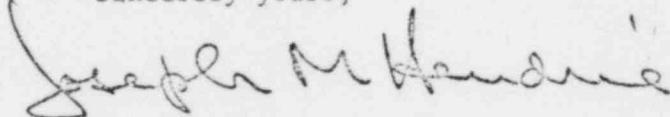
The applicant has stated that he will provide additional evidence obtained by improved multi-node analytical techniques to assure that the ECCS is capable of limiting core temperatures to acceptably conservative values. He will also make appropriate plant changes if further analyses demonstrates that such changes are required. This matter should be resolved during construction in a manner satisfactory to the Regulatory Staff. The Committee wishes to be kept informed.

The line connecting the refueling water storage tank to the low-pressure safety injection system and the lines connecting each accumulator to the remainder of its piping system contain a normally open motor-operated valve. Since inadvertent closing of these valves would seriously degrade emergency core cooling capability, the Committee believes that more positive assurance of proper valve function should be provided.

Other problems related to large water reactors have been identified by the Regulatory Staff and the ACRS and cited in previous ACRS reports. The Committee believes that resolution of these items should apply equally to the North Anna Power Station.

The Committee believes that the above items can be resolved during construction and that, if due consideration is given to these items, the North Anna Power Station Units 1 and 2 can be constructed with reasonable assurance that they can be operated without undue risk to the health and safety of the public.

Sincerely yours,



Joseph M. Hendrie
Chairman

References

- 1) Amendments 1 - 11 to the License Application

POOR
ORIGINAL