

Northern States Power Company  
Monticello Nuclear Generating Plant

AEC Docket No. 50-263

Hydrology

The Monticello Nuclear Generating Plant is located on the south bank of the Mississippi River, Wright County, Minnesota. It is 3 miles southwest of the Village of Monticello, 22 miles southeast of St. Cloud, and 30 miles northeast of the suburbs of Minneapolis. The boiling-water reactor will operate up to a power level of 1,670 megawatts thermal or 545.4 megawatts electrical.

Comments on the hydrologic analysis as presented by the applicant are based on a review of the "Final Safety Analysis Report" and "Amendments", an independent check of available data and literature, and a site visit conducted August 18, 1969, and are made in regard to the application for an operating license. The analysis as presented by the applicant appears to present an adequate assessment of the hydrologic conditions pertinent to the safety evaluation of the site. Reference is made to an attached copy of the hydrologic review prepared by E. L. Meyer on April 3, 1967, in regard to the application for a construction license.

The discharge computed for the probable maximum flood, as defined by the Corps of Engineers, is 354,800 cubic feet per second. This discharge is approximately 2.1 times greater than maximum discharges observed for nearby, like-sized, drainage basins which appear to exhibit similar extreme-flood-producing characteristics, and it is 7.0 times greater than the maximum discharge observed at the site in April, 1965 (52,000 cubic feet per second; stage = 916.2 feet above mean sea level). The stage corresponding to the probable maximum flood discharge (939.2 feet above mean sea level) was determined using standard backwater computations and it appears to be a reasonable figure. All structures have been designed for a flood level of 133 feet above mean sea level.

Condenser cooling will be accomplished with or without cooling towers; and if with cooling towers, with full, partial, or no recirculation. The method of cooling will be such that the thermal releases will meet the standards of the Minnesota Pollution Control Agency. Once-through circulation with or without cooling towers will require a river supply of 650 cubic feet per second. A closed-cycle circulation with cooling towers will require approximately 54 cubic feet per second. The river-water requirement for safe shutdown of the plant is less than 50 cubic feet per second. The applicant's estimate of the minimum flow (240 cubic feet per second) and average annual flow (4,600 cubic feet per second) at the site are reasonable. Based on 35 years of streamflow record for the Mississippi River near Royalton and on 40 years of streamflow record for the Mississippi River at Elk River, the annual minimum, 7-consecutive-day discharge that may be expected to occur at the site at an average interval of 10 years is about

740 cubic feet per second. The stretched elevation at the site is about 900 feet above mean sea level and the intake canal will be excavated to an elevation of 895 feet above mean sea level. To prevent icing, provisions have been made to divert a portion of the warm condenser-cooling water to the intake structure. Neglecting any existing diversions of Mississippi River water and governmental regulations concerning future diversions and use of river water, it appears that an adequate supply of cooling water will be available at the site for safe operation and/or shutdown of the plant.

The water supplies of St. Paul and Minneapolis are taken directly from the Mississippi River some 33 and 37 miles downstream respectively from the site. In addition, the Mississippi River downstream from the site is used for irrigation and recreation. The applicant states that operationally produced radionuclides will be released to the condenser-cooling water on a batch basis such that their concentration in the discharge canal will always be at or below the limits given in 10 CFR 20, i.e., the annual averaging provision of 10 CFR 20 will not be used. The applicant's estimates of the concentration of radionuclides in the river at the plant site resulting from various accidental releases by discharge or by rupture of the applicant's radioactive waste tanks are below limits given in 10 CFR 20. The assumption concerning movement of accidentally released radionuclides to the river are reasonable. The estimates of concentrations of radionuclides occurring in the river under various river flow and discharge rates and at the irrigation and water-supply intakes, resulting from either operational or accidental releases, are based on the reasonable assumption of complete mixing of the effluent with the receiving river water and the conservative assumptions of no dilution by river-water secessions, no dispersion after initial mixing, no deposition in the river bed, and no radioactive decay.

Numerous cities along the Mississippi River downstream from the site obtain their water supplies from the artesian aquifer in the consolidated sandstones underlying the surficial glacial drift. In addition, numerous private water-table wells are finished in the glacial drift. The normal hydraulic gradient in the glacial drift near the river is toward the river. Also, the glacial drift is hydraulically connected with the river and ground-water levels fluctuate with the river level. The normal direction of the hydraulic gradient could be reversed locally by pumping from shallow wells or, during flooding, the direction of the gradient could also be reversed, causing river water to move into the shallow aquifers. If passage from the artesian aquifer were to increase sufficiently some downward percolation of this river water into the artesian aquifer could occur. Hence, if radionuclides were present in the river water they could enter both the water-table and artesian aquifers under the specified conditions. It should be noted, however, that the concentration of radionuclides in the river water is at all times expected to be below limits specified in 10 CFR 20.

