Nebraska Public Power District
Proposed Change to
Environmental Technical Specifications
for
Cooper Nuclear Station
NRC Docket No. 50-298, DPR-46

Proposed Change

Delete from Section 4.0 Environmental Surveillance Studies all of 4.1.1.1 Surveillance, Study, and Evaluation Program (Pages 30-41).

Supporting Information

Sufficient data have been gathered during water quality, periphyton, aquatic macroinvertebrate and benthic organisms, and fisheries studies at Cooper Nuclear Station to justify their deletion from the Environmental Technical Specifications (NRC Docket No. 50-298, DPR-46).

The following justifications summarize the results of studies conducted at Cooper Nuclear Station since 1972. Detailed results of water quality, periphyton, aquatic macroinvertebrates and benthic organisms, and fisheries studies conducted through 1978 have been presented in annual reports (see attached bibliography). In addition, a report summarizing the biological, engineering, and hydrological data for the first year of commercial operation (July 1974-July 1975) was prepared for the Nebraska Department of Environmental Control (NDEC) (NALCO Environmental Sciences 1975). This report documented the effects of station operation on Missouri River water quality and aquatic biota in response to the requirements of Section 316(a) of Public Law 92-500 and Rule 33 of the NDEC.

Justifications

Water Quality

The water quality portion of Section 4.1.1.1 Surveillance, Study, and Evaluation Programs of the Technical Specifications for Cooper Nuclear Station was designed from the results of preliminary studies, predictions made in the Environmental Statement, and water quality standards and criteria

as stated by the Nebraska Department of Environmental Control and the Environmental Technical Specifications.

Water quality of the Missouri River near Cooper Nuclear Station is highly variable and is strongly influenced by surface runoff. An increase in organic loading, and suspended solids and its associated constituents, and a decrease in dissolved matter generally result from runoff-related flow increases. The levels of chemical constituents indicate that Missouri River water quality decreases with increases in surface runoff. Nutrient concentrations were always adequate to support aquatic life and heavy metals concentrations were generally below toxicity levels.

Concentrations of applicable water quality parameters generally complied with Nebraska Department of Environmental Control standards and/or the Environmental Technical Specifications. Exceptions included fecal coliform densities which consistently exceeded the standard and phenols which occasionally exceeded the standard. These standards were exceeded both upstream and downstream of Cooper Nuclear Station and were not influenced by the station's effluent. In addition, turbidity levels have occasionally exceeded the standard which is based on differences between intake and discharge values. Spatial variability of turbidity values has been considerable and there has been no trend relative to station operation.

Although considerable temporal variation attributable to surface runoff occurred, spatial differences in concentrations of chemical constituents were generally slight. Of the 40 water quality parameters measured only water temperature and oxygen saturation have demonstrated an upstream to downstream trend attributable to station operation. Oxygen concentration remains virtually unaffected during condenser passage while water temperature increases. Because

oxygen solubility decreases with increasing temperature and loss of dissolved oxygen is minimal, oxygen saturation increases. However, oxygen saturation levels approximately 2000 ft downstream of the discharge canal were similar to those at control locations. The Environmental Technical Specifications for allowable increases in water temperature have not been exceeded.

The overall similarity in water quality upstream and downstream of Cooper Nuclear Station indicates that station operation has not had a deleterious effect on Missouri River water quality.

Deletion of water quality studies from the Environmental Technical Specifications will not affect the monitoring being conducted in accordance with requirements of the National Pollutant Discharge Elimination System (NPDES) Permit. In Nebraska the NPDES program is administered by the Nebraska Department of Environmental Control.

Periphyton

The periphyton (attached algae) portion of Section 4.1.1.1 Surveillance, Study, and Evaluation Programs of the Technical Specifications for Cooper Nuclear Station was designed from the results of preliminary studies and predictions made in the Environmental Statement. Studies conducted prior to 1974, the initial year of Station operation, and since 1974 have provided data on periphyton species composition and abundance and biomass production. The pre-operational and operational studies have been adequate to determine seasonal and year-to-year variability and to assess the effects of station operation on the Missouri River periphyton community.

Preliminary studies of the periphyton community in the Missouri River near Cooper Nuclear Station involved the collection of samples from natural substrates. However, fluctuating water levels in combination with excessive turbidity greatly limited periphyton growth on natural substrates. Beginning

in 1972 floating artificial substrates (plexiglass plates) were utilized to provide more suitable conditions for periphytic algal growth. Five sampling locations were established and substrates were placed in May. Collections were made monthly from June-November. The location furthest downstream (RM 526) was deleted from the sampling schedule in 1976 based on data which indicated a low degree of thermal influence and a lack of a measurable biological impact. An additional sampling location in the Cooper Nuclear Station discharge canal for periphyton species composition and abundance determinations was added to the study program in 1976.

Diatoms have usually dominated the periphytic algal community in the Missouri River near Cooper Nuclear Station. The seasonal pattern of periphytic algae has generally been Gomphonema, Fragilaria, and Nitzschia in spring to midsummer; Navicula, Gomphonema, Cocconeis, and Biddulphia in late summer; and Biddulphia, Cocconeis, Navicula, and Nitzschia in the fall. Navicula tripunctata var. schizonemoides, Cocconeis placentula var. euglypta, Biddulphia laevis, Gomphonema parvulum, and G. olivaceum have frequently been the most abundant species. Green algae including Stigeoclonium and Cladophora and blue-green algae including Lyngbya and Oscillatoria have occasionally been abundant; however, their occurrence has shown no spatial or temporal pattern. Periphytic algal abundance and species composition have been similar among sampling locations on the Missouri River; however, species composition at the discharge canal location during midsummer collections has generally been different from the other locations. The periphytic algal community in the discharge canal during July and August has been dominated by the diatom Navicula luzonensis. The occurrence of this taxon was restricted to the discharge canal during 1976 and 1978,

whereas in 1977 when the station was operating at a relatively high power level and the Missouri River flow rate was relatively low, N. luzonensis was also present downstream of the station at RM 532 and 530. This shift in species composition in the discharge canal and immediately downstream during midsummer is the only noted effect that the station's thermal effluent has had on the periphytic algal community. Navicula luzonensis is not considered a nuisance taxon and therefore this shift in species composition is not considered an adverse impact. The absence of a trend in biomass production attributable to the thermal effluent further indicates that the operation of Cooper Nuclear Station has not had an appreciable effect on the Missouri River periphyton community.

A data base consisting of 226 points has been used to develop regression equations that depict the apparent optimal temperatures for the dominant periphytic taxa occurring in the Missouri River near Cooper Nuclear Station. The slope of the regression line was further used to define the amount of temperature increase necessary to induce a tenfold change in density. Temperature increases ranging from 5.4 to 18.5C (9.7-33.3F) were necessary to induce an order of magnitude change in the density of dominant taxa. Increases in temperature sufficient to induce this change occurred only in or near the discharge canal. Therefore, the operation of Cooper Nuclear Station under existing temperature conditions has not significantly affected the periphytic community downstream of the discharge canal.

Aquatic Macroinvertebrates and Benthic Organisms

The macroinvertebrate portion of Section 4.1.1.1 Surveillance, Study, and Evaluation Programs of the Technical Specifications for Cooper Nuclear Station was designed from the results of preliminary studies and

predictions made in the Environmental Statement. Preliminary surveys demonstrated that macroinvertebrate populations were primarily restricted to the rock revetments along the shoreline and to the soft substrate that occurs behind the wing dams. The monitoring program initiated in 1972 was designed to sample these two habitat types.

Aquatic macroinvertebrates and benthic organisms have been sampled with rock basket samplers (1972-74), multiple plate samplers (1975-78), and Ponar dredge (1972-78). Extreme variability in macroinvertebrate abundance among rock basket replicates necessitated the use of multiple plate samplers. Results of macroinvertebrate studies have provided information on seasonal and year-to-year variability in species composition and abundance and have been adequate to assess the effects of operation of Cooper Nuclear Station on the Missouri River macroinvertebrate community. Five sampling locations were originally established and collections were made three times a year (usually June, August, and October). Because of the low degree of thermal influence and the absence of a measurable biological impact, sampling was discontinued at RM 526 in 1976. In addition to the above monitoring program, multiple plate samplers were also collected from the discharge canal during 1977 and 1978.

Species of mayflies (primarily Caenidae), caddisflies (primarily Hydropsychidae), and midges (Chironomidae) have generally dominated the artificial substrate collections. Species composition has generally been similar among locations; however, macroinvertebrate densities have varied both spatially and temporally. Differences in density have been attributed to minor variations in the physical habitat among locations and considerable year-to-year variation in Missouri River flow rate. A few significant differences ($p \leq 0.05$) have occurred among locations; however, these differences

have occurred randomly and have not demonstrated a trend in relation to Cooper Nuclear Station's thermal effluent.

Species composition on the multiple plate samplers collected from the discharge canal during 1977 and 1978 was similar to the species composition reported from the river locations. A few significant differences ($p \leq 0.05$) in macroinvertebrate densities between the discharge canal and river locations occurred during both years. In contrast to the river locations which had lower densities in 1978 than in 1977, total densities in the discharge canal were similar between years. This trend indicates that the thermal influence is less important in determining macroinvertebrate densities than are the stable flow conditions that exist in the discharge canal.

Ponar dredge collections have been dominated by immature tubificid worms with Limnodrilus cervix and L. hoffmeisteri being the most abundant identifiable taxa. Tubificid densities are slightly higher at the location immediately downstream of the discharge canal; however, species composition has generally been similar among locations. Variation in abundance among locations has been related to differences in total organic carbon content and texture of the sediments. Variations among collection dates have been related to fluctuations in water level with prolonged periods of stable flow generally resulting in increased benthic abundance. Statistical differences ($p \leq 0.05$) among locations have occurred randomly and have not demonstrated a trend of thermal influence.

Macroinvertebrate studies conducted since 1972 with artificial substrates and Ponar dredge have demonstrated that variation in river flow has been the primary factor in determining macroinvertebrate abundance. Similarity in species composition among locations including the discharge canal and the

absence of a trend in macroinvertebrate abundance indicate that the Cooper Nuclear Station's thermal effluent has not had an appreciable effect on the Missouri River macroinvertebrate community.

Fisheries Study

The fish population and life history portion of Section 4.1.1.1 Surveillance, Study, and Evaluation Programs of the Technical Specifications for Cooper Nuclear Station was designed from the results of preliminary studies and predictions made in the Environmental Statement. Prior to 1973 the adult and juvenile fish sampling program at Cooper Nuclear Station varied in scope. Since 1973 sampling has been conducted monthly (May-November) by electroshocking and seining at three locations on both the Nebraska and Missouri shorelines. Operational studies have also included electroshocking in the discharge canal. Sampling was conducted to determine the species composition, relative abundance, spatial distribution and movements of fish within the study area. Age and growth characteristics and food habits of game fish populations were also determined.

River carpsucker, gizzard shad, and carp have dominated the electroshocking catch whereas several species of game fish have collectively comprised about 15% of the total catch. Catch per unit of effort has varied among locations during both preoperational and operational studies. Variation in catch rate among sampling locations on the Missouri River has been attributed to differences in the suitability of habitat. Excluding periods of high river flow when sampling efficiency is low, catch rates during operational and preoperational studies have been similar. Catch rate in the discharge canal generally has been higher than at the other locations during periods of low ambient temperature and lower during midsummer. Mature carp are attracted

to the discharge canal during spring whereas channel catfish and young-of-the-year gizzard shad tend to be attracted to the discharge canal during fall months. Thermal attraction of fishes as suggested by catch data should be interpreted with caution since gear efficiency was probably higher in the discharge canal than at the remaining locations. Higher water temperature and relatively shallow depth (1-2 m) would tend to increase electroshocking efficiency. Most species have avoided the discharge canal during midsummer. There was no indication that fish were either attracted to or avoided the sampling location immediately downstream of the discharge canal.

Predominant species collected by seining included the river shiner, western silvery minnow, and plains minnow. Spatial and temporal variations in seine haul collections have been attributed to suitability of collection sites and efficiency of sampling under different river flow conditions. There has been no indication that either minnows or young-of-the-year individuals avoid or are attracted to the sampling location immediately downstream of Cooper Nuclear Station.

A relatively small percentage of fish tagged in the vicinity of Cooper Nuclear Station has been recaptured. Fisherman tag returns have demonstrated considerable upstream and downstream movement as tagged carp were caught in the Platte River near Clarks, Nebraska (upstream movement of approximately 200 miles) and in the Maries River near Jefferson City, Missouri (downstream movement of approximately 275 miles). Most individuals recaptured during subsequent sampling trips demonstrated no movement; however, some upstream, downstream, and across the river movement did occur. Although recapture data are limited, there has been no indication that the thermal effluent restricts fish movement.

Results of age and growth studies on game fish have not demonstrated any changes in the Missouri River fish community since Cooper Nuclear Station began operation in 1974. Similarly, food habits of game fish have not changed since Cooper Nuclear Station became operational.

In addition to the adult and juvenile fish studies, fish larval drift samples have been collected since 1973. Sampling effort and the design of the fish larvae program have varied yearly. Samples have been collected from two to five locations an average of 11 times per year. Larval drift studies have been designed to determine species composition and abundance, horizontal distribution, and effects of condenser passage and entrainment on larval fish survival. Sampling effort has generally been limited to the months of May, June, and July. Additional fish larvae studies were conducted from 1974-76 at Cooper Nuclear Station by Cada (1977).

Fish larvae drift in the Missouri River is comprised primarily of freshwater drum, Cyprinidae (minnows), and Catostomidae (suckers) which collectively have constituted 75 to 98% of the total annual larval assemblage. Peak larval fish abundance occurs from mid-June to mid-July and corresponds to the peak in freshwater drum abundance. Excluding freshwater drum, game fish larvae in the drift are uncommon and generally comprise less than 1% of the total assemblage.

Relative abundance and species composition of larval fishes have been similar among locations; however, total density has varied. Horizontally, larval density tends to be highest along the Nebraska shoreline and lowest in mid-channel whereas larval density along the Missouri shoreline tends to be intermediate. Similar studies conducted upstream of Cooper Nuclear Station near Fort Calhoun, Nebraska have also indicated that larval density is usually

higher along the cutting bank. Larval fish density at the discharge canal has averaged about 40% lower than at the intake. The consistently lower discharge density is indicative of a vertical distribution pattern. Intake samples have been collected near the surface whereas discharge canal water is derived from the entire water column. Vertical distribution sampling on the Missouri River upstream of Cooper Nuclear Station has indicated that larval density is greatest near the surface.

In addition to the requirements of the Technical Specifications, studies on the effects of condenser passage on larval fish survival have been conducted. Results of these studies have been inconclusive. Collection mortality and an apparent high natural mortality have generally resulted in a low percentage of live larvae at control locations. Samples collected at relatively low current velocity in the discharge canal have frequently contained a higher percentage of live larvae than at the control locations. Increased current velocity is expected to increase collection mortality. After correcting for differences in current velocity between the intake and discharge locations, Cada (1977) found significantly greater mortality at the discharge location. Samples collected downstream of the discharge canal in the 1C isotherm were not significantly different from the intake location.

Cross-channel distribution of larval fish in 1978 was calculated from vertically integrated samples collected at three locations along a transect. An approximately equal volume of water was filtered from the bottom, mid-depth, and surface of the water column for each integrated sample. This sampling technique was considered more accurate than the surface sampling technique utilized in previous studies. Based on the 1978

horizontal distribution of fish larvae, percent of river water used for cooling, and the channel configuration, an estimated 3.7% of the larvae passing the station were subjected to condenser passage.

Based on the relatively low percentage of larvae subjected to condenser passage, effects of station operation on the Missouri River fish larvae assemblage appear to be minimal.

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