May 30, 2003

Mr. Robert F. Stewart
Regional Environmental Officer
U.S. Department of the Interior
Office of the Secretary
Office of Environmental Policy and Compliance
Denver Federal Center, Building 56, Room 1003
P.O. Box 25007 (D108)
Denver Colorado 80255-0007

SUBJECT: RESPONSE TO THE U.S. DEPARTMENT OF THE INTERIOR'S COMMENTS ON THE DRAFT SUPPLEMENT 12 TO THE GENERIC ENVIRONMENTAL IMPACT STATEMENT FOR LICENSE RENEWAL OF NUCLEAR PLANTS, REGARDING FORT CALHOUN STATION, UNIT 1

Dear Mr. Stewart:

By a letter dated April 1, 2003, the U.S. Department of the Interior provided its comments on the NRC's draft supplemental environmental impact statement regarding Fort Calhoun Station, Unit 1 license renewal. The U.S. Department of the Interior's comments are the same as information requested by the U.S. Fish and Wildlife Service (USFWS) in a letter dated January 13, 2003. The USFWS's letter was in response to the NRC's request for the USFWS to concur in the NRC's biological assessment (BA). The NRC is providing the same response to the U.S. Department of the Interior as it did to the USFWS in a letter dated May 30, 2003.

The BA addressed the expected impacts resulting from an additional 20 years of FCS operation on five federally threatened or endangered species having the potential to occur in the general vicinity of the station. The NRC staff concluded that renewal of the FCS operating license may affect, but is not likely to adversely affect, the pallid sturgeon and bald eagle, and will have no effect on the remaining three species. The NRC forwarded the BA to FWS in a letter dated December 9, 2002, and requested FWS concurrence in the NRC Staff's conclusions relative to the five species discussed in the BA.

In your January 13, 2003, response you stated that additional information was required before the FWS could concur with the NRC's determination of "not likely to adversely affect" for the endangered pallid sturgeon, *Scaphirhynchus albus*. You asked four specific questions regarding the thermal regime in the Missouri River below the Station discharge. In addition, your letter stated that larval fish monitoring studies at the FCS should be reinitiated to verify that pallid sturgeon larvae are not being adversely affected by FCS operations. The attachment to this letter provides responses to your request for information.

After an extensive review, the NRC staff still considers the December 9, 2002, BA to be its assessment of record for the FCS, as supplemented by the information contained in the attachment to this letter. The NRC continues to conclude that the proposed action may affect but is not likely to adversely affect the pallid sturgeon. The NRC staff has determined, based

on the known distribution of the pallid sturgeon in the Missouri River, the volume of water withdrawn by the station, the extent of the thermal plume, life history information on the pallid sturgeon and related species, and the questionable value of additional larval sturgeon collection studies in the channelized portion of the Missouri River that there is no need to conduct additional larval monitoring studies at this time.

The NRC would like to clarify its schedule for the review of Fort Calhoun Station's license renewal application. The NRC is considering an application for renewal of the operating license for the Fort Calhoun Station, Unit 1 for an additional 20 years beyond the original license expiration date of 2013 (i.e., to 2033). The NRC is scheduled to issue the Final Supplemental Environmental Impact Statement (SEIS) by August 15, 2003, and will make its license renewal decision by November 2003. The renewed license, if issued, will supercede the original license and will be valid from date of issuance in November of 2003 until August 9, 2033.

If you have any questions regarding this response to your request for additional information, please contact the environmental license renewal project manager, Jack Cushing, by telephone at (301) 415-1424 or by e-mail at jxc9@nrc.gov.

Sincerely,
/RA/
Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No.: 50-285

Enclosure: As stated

on the known distribution of the pallid sturgeon in the Missouri River, the volume of water withdrawn by the station, the extent of the thermal plume, life history information on the pallid sturgeon and related species, and the questionable value of additional larval sturgeon collection studies in the channelized portion of the Missouri River that there is no need to conduct additional larval monitoring studies at this time.

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Sincerely,
/RA/
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Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No.: 50-285

Enclosure: As Stated

cc w/encl: See next page

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Response to U.S. Fish and Wildlife Service's
January 13, 2003 Request for Additional Information
Fort Calhoun Station, Unit 1, Nuclear Power Plant

Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

May 2003

Introduction

The U.S. Nuclear Regulatory Commission (NRC) is considering an application for renewal of the operating license for the Omaha Public Power District's (OPPD) Fort Calhoun Station, Unit 1 (FCS) for an additional 20 years beyond the expiration date of the current operating license (i.e., to 2033). The FCS is located on the west bank of the Missouri River at river kilometer RKm 1039 (River Mile [RM 646]) The renewed license, if approved, is scheduled to be issued by November 2003.

The NRC submitted a Biological Assessment (BA) to the U.S. Fish and Wildlife Service (FWS) on December 9, 2002 (NRC 2002). The NRC requested comments on the BA and concurrence on the conclusion that the proposed action (i.e., renewal of the operating license for FCS) may affect, but is not likely to adversely affect the pallid sturgeon and the bald eagle and will have no effect on the western fringed orchid, piping plover, or the least tern. One of the species that could potentially inhabit the Missouri River in the vicinity of the Station is the pallid sturgeon, *Scaphirhynchus albus*.

After reviewing the BA, the FWS indicated in its letter of January 13, 2003, that additional information would be required by the FWS related to the pallid sturgeon prior to taking any action on the NRC's request for concurrence (FWS 2003). The FWS requested additional information on FCS's thermal discharge plume as well as requesting re-initiation of larval fish monitoring studies in the vicinity of FCS to verify that pallid sturgeon larvae are not being adversely affected by station operations. This attachment responds to the FWS request for additional information.

Thermal Discharge

A cooperative effort was conducted among OPPD, the U.S. Environmental Protection Agency (EPA), and the Nebraska Department of Environmental Quality (NDEQ) to evaluate the characteristics of the thermal discharge from FCS using computer modeling (CORMIX) and field verification (OPPD 2003). The purpose of this effort was to map heat in the Missouri River and to predict compliance with the Nebraska State Water Quality Standards under various river conditions for the purpose of establishing the appropriate national pollution discharge elimination system (NPDES) permit limits. The results from the recent CORMIX study have been used, in addition to past studies at FCS, as the basis for the NRC's response.

By a letter dated April 10, 2003, the EPA provided the final CORMIX data to the NRC (EPA 2003). The NRC can provide a copy of the data upon request. The study examined thermal plume characteristics from FCS discharges, specifically, under the 7-day 10-year low flow (7Q10) in the Missouri River. This study was performed using the EPA-approved CORMIX computer model and included intensive in river temperature monitoring. The results (EPA 2003) indicate that even under extreme low summer flow conditions and at 100 percent station power and maximum heat rejection rates, changes in the Missouri River temperature 1524 m (5000 ft) downstream of the FCS discharge will not exceed the National Pollutant Discharge Elimination System (NPDES) maximum temperature limit of 32°C (90°F) or the maximum change ($\triangle$T) in river temperature of 2.8°C (5°F). In addition, telephone conversations with the EPA staff involved in the study have confirmed that discharges from FCS would experience overwhelming mixing and be indistinguishable from ambient river water well before the confluence of the Platte and Missouri Rivers (Dunn 2003).

The studies have demonstrated that the impact of thermal discharges from FCS on temperature regime in the Missouri River is minor. In addition, the thermal discharge from FCS would be undetectable just a few miles downstream of the station and would have no impact by the confluence of the Platte and Missouri Rivers, approximately 80.5 river km (50 river miles) downstream. The specific questions asked in your January 13, 2003, letter are addressed below.

1. How warm is the released water after it is discharged from FCS?

As discussed in the NRC's BA (NRC 2002), the maximum cooling water intake and discharge flow during FCS's normal operations occurs in summer, and amounts to approximately 23 cubic meters per second (m^3/s) (827 cubic feet per second [cfs]), or about 2 percent of the average summer river flow. At the plant's currently authorized maximum power level of 1500 megawatts-thermal (MWt), in effect since 1980, this cooling water is usually discharged at a nominal temperature of approximately 12.8°C (23°F) higher than the ambient river temperature in the summer. In the winter, this temperature differential is approximately 17.2-17.8 °C (31 – 32 °F) when a portion of the heated discharge is recirculated back to the intake structure to prevent icing (OPPD 2002). In the spring and fall when river temperatures are cool, the cooling water discharge may range approximately .6-1.7 °C (1 - 3 °F) higher than the summer nominal temperature differential of 12.8°C (23°F), and in winter the temperature differential can range several degrees higher than 17.2-17.8 °C (31 – 32 °F), reflecting the use of fewer cooling water pumps and higher efficiencies of plant heat exchangers and condensers during those times.

Several modeling and monitoring studies were conducted by the OPPD, in cooperation with others, from 1973 through 1977 to determine the characteristics of the thermal discharge from FCS (OPPD 1978). These studies were conducted prior to 1980 when the maximum authorized power level and discharge temperature of FCS was lower than present (i.e., 1420 MWt). Results from the 1973 to 1977 studies demonstrated that the Atomic Energy Commission's initial projections for the FCS thermal plume dimensions bounded conditions projected for the current FCS power level (OPPD 2002).

The maximum temperature of the FCS discharge authorized under the current NPDES permit for the plant is 43.3 °C (110° F). However, a temporary authorization of 44.4 °C (112° F) is allowed in view of unusually high ambient river temperatures that have occurred in recent years. Based on the results of the CORMIX study the EPA has suggested that the NPDES permit limits for FCS allow the current peak discharges as the permit limit (EPA 2003).

2. How far downstream does the released water travel before being fully mixed with the Missouri River in the May-July time period? Does this distance vary under high and low flow conditions?

The downstream distance that FCS cooling water travels before being fully mixed has not been directly assessed in the current CORMIX studies, which have focused on conformance to provisions of Nebraska Title 117 Chapter 1, Section 041, for mixing zones: i.e., that limited area or volume of a water body designated by NDEQ that is allowed for mixing of the discharge, upon meeting initial discharge limits. The CORMIX thermal plume modeling results using near worst case summer low flow conditions indicate that the plume temperature would fall to approximately 1.5 °C (2.7 °F) above river ambient temperature at a point 1524 m (5000 feet)

downstream, the distance assumed at the end of the mixing zone (OPPD 2003). This modeling run assumed only circulating water flow from the plant of 22.7 m^3/s (802 cfs) which is slightly lower than total discharge of 23 m^3/s (827 cfs), a discharge temperature of 13.1 °C (23.6 °F) above river ambient temperature, which approximates full power conditions and worst case summer river conditions, including a summer 7-day, 10-year low flow (7Q10) of 818 m^3/s (28,892 cfs) and an ambient river temperature of 30.6 °C (87° F). Historical thermal plume studies indicate that low river flows result in poorer mixing conditions than high river flow conditions, so predicted plume temperature at a point 1524 m (5000 feet) downstream would be lower at higher river flows (OPPD 1978, Section III, page 8).

Historical triple-depth field monitoring of the plume in August 1975 provides an example of how rapidly temperatures dissipate in the near field part of the plume during typical summer conditions. At the time those measurements were made, the plant was operating at 96 percent power level, initial discharge temperature was 9.2 °C (16.6 °F) above river ambient temperature, and river flow was 991 m^3/s (35,000 cfs). Results indicated that maximum plume temperatures were .95 °C (1.7 °F) and .78 °C (1.4 °F) above ambient temperature within 487.6 meters (1600 feet) and 1768.8 meters (5800 feet) of the discharge point, respectively (OPPD 1978, Section III, Table 18).

3. How much does the water plume warm the Missouri River in total after mixing? Does the amount of warming vary under high and low flow conditions?

Simple dilution calculations can be used to provide theoretical estimates of river temperature increases after total mixing. Assuming a cooling water discharge flow of 23 m^3/s (827 cfs) at an assumed temperature increase of 13.1 °C (23.6 °F), which approximates maximum plant power level in summer, the average river temperature would be increased by approximately .4 °C (0.7 °F) under summer low flow conditions (7Q10) of 818 m^3/s (28,892 cfs), and by approximately .1 °C (0.2 °F) under a summer maximum monthly average flow (July) of 2,224 m^3/s (78,560 cfs). However, as may be inferred from the response to Question 2 above, full mixing likely occurs within a few miles below the outfall, and heat dissipation factors other than dilution (e.g., heat loss to the atmosphere) are important in reducing plume temperature.

4. During the pallid sturgeon spawning period (May – July), how far downstream (under high and low flow conditions) is a temperature change detectable? Is it detectable at the mouth of the Platte River?

As noted above, the results of the CORMIX study have focused on near-field plume temperatures (e.g., at 1524 meters [5000 feet] downstream). However, it is expected that plume excess temperatures would be virtually indistinguishable within a few miles downstream from the outfall. For example, results of triple-depth field monitoring of the thermal plume under conditions cited above in the response to Question 2 indicate that plume excess temperatures were mostly at or below .6 °C (1 °F) within approximately 6.4 kilometers (4 miles) below the outfall (OPPD 1978, Section III, Table 18). Diurnal variations in the ambient river may be as high as 1.7 °C (3 °F), based on FCS operations logs. The mouth of the Platte River is approximately 80.5 river kilometers (RKm) (50 river miles [RM]) downstream from FCS. The FCS thermal plume is undetectable many miles upstream from the mouth of the Platte River. Therefore the staff concludes that since the thermal plume is undetectable many miles upstream of the Platte River the thermal plume from FCS would not result in inappropriate spawning cues to the pallid sturgeon.

Larval Fish Monitoring Studies

The FWS notes that, although no pallid sturgeon spawning has been documented in the Missouri River between FCS RKm 1039 (RM 646) and Gavins Point Dam at RKm 1305 (RM 811), there appears to be potential spawning habitat between Gavins Point Dam and Ponca State Park RKm 1213 (RM 753.5) (FWS 2003). The FWS further indicates that, if spawning does occur in that reach of the river, then pallid sturgeon larvae may drift as far downstream as FCS and be susceptible to entrainment. Noting that the NRC's assessment indicates that larval monitoring at FCS ended in 1977 and that the current operating license for FCS does not expire until 2013, FWS requested that the FCS larval monitoring studies be reinitiated "to verify that pallid sturgeon larvae are not being adversely affected by FCS operations" (FWS 2003).

The NRC does not believe that reinstatement of larval monitoring studies at FCS is warranted for several reasons, most of which were discussed in the NRC's Biological Assessment (NRC 2002). The following discussion highlights these reasons and provides relevant supporting information.

1. Rarity of Pallid Sturgeon near FCS

The relative rarity of pallid sturgeons in the vicinity of FCS and upstream to Gavins Point Dam is indicated by historical collections. No pallid sturgeons were reported to be collected in the extensive monitoring studies conducted by OPPD and others in the FCS vicinity in the 1970s (OPPD 1978, Hesse, Bliss, and Zuerlein 1982). Kallemeyn and Novotney (1977) collected 248 sturgeons as a result of extensive collections in 1976 at one station in the unchannelized reach below Fort Randall Dam RK 1416 (RM 880), two stations in the unchannelized reach below Gavins Point Dam, and one station in the channelized reach below Sioux City, Iowa. Only one pallid sturgeon was found in these collections, in the reach below Fort Randall Dam. All of the remainder were shovelnose sturgeons and, of these, 227 were collected in the unchannelized reach below Gavins Point. No sturgeons were collected in the channelized reach below Sioux City. This finding is consistent with the low catches of shovelnose sturgeons in the OPPD studies for FCS (OPPD 1978).

In the lower Missouri river, within which FCS is situated, more recent documented occurrences of pallid sturgeon are rare. According to the Nebraska Natural Heritage Program (NGPC 2001), between Gavins Point Dam, including its tailwaters, and Nemaha County, approximately at RKm 887 (RM 525), 32 occurrences of pallid sturgeon were documented from January 1980 through June of 2001. FCS is located at RKm 1039 (RM 646). The number of pallid sturgeon occurring upstream of FCS, according to this data source (NGPC 2001), is 15 out of the 32 occurrences with 17 out of the 32 occurrences downstream of FCS and approximately 7 out of the 32 occurrences documented at the Plattsmouth Bend. This data source (NGPC 2001) also documents an additional 8 pallid sturgeons near the confluence of the Platte and Missouri Rivers, but in the Platte River, during this same time period (i.e., from RKm 0.0 to RKm 53 [RM 0.0 to RM 33] within the Platte river). In a separate study funded by the U.S. Army Corps of Engineers (USACE) and carried out by the Nebraska Game and Parks Commission (Mestl 2003), 13 pallid sturgeons were documented in this same reach of the lower Missouri River (i.e., between RKm 1305 and Rkm 887 [RM 811 and RM 525]) during 2001-2002. The majority of these (i.e., 10 out of the 13 pallid sturgeons) were located near the Plattsmouth Bend (approximately Rkm 954-956 [RM 593-594]).

In summary the studies done by OPPD in the early 1970's documented no occurrences of pallid sturgeons in the reach of the river near FCS and the Natural Heritage Program has documented only 15 occurrences of pallid sturgeons upstream of FCS to Gavins Point Dam, in the years ranging from January 1980 through June 2001 (NGPC 2001), while NGPC documented none upstream of FCS in their independent study carried out in 2001 and 2002 (Mestl 2003).

2. Low Probability of Spawning Upstream of FCS

The rarity of juvenile and adult pallid sturgeon in the Missouri River from Gavins Point to St. Louis is indicated by recent collections that have included the lower Missouri River, in which the species has comprised only 0.2 to 0.4 percent of total river sturgeons collected (FWS 2000, page 104). Both the rarity of the species in the river and in the FCS site vicinity and upstream to Gavins Point indicates that there is a low potential production of larvae upstream from FCS. As noted above, there have been relatively more observations of this species on the Missouri River near the mouth of the Platte River, approximately 80.5 river kilometers (50 river miles) downstream from FCS.

The low potential for significant numbers of pallid sturgeon larvae to occur in the drift at FCS is supported by the low incidence of *Scaphirhynchus sp.* larvae found in intensive Missouri River fish larvae collections by OPPD and others in the vicinity of FCS in the 1970s. A review of available summary reports for that period indicate that the number of *Scaphirhynchus sp.* larvae collected in these efforts included none in 1974 and 1975, 1 in 1976, and one to a few in 1977 (OPPD 1978; OPPD 1977). Harrow and Schlesinger (1980) collected only 23 *Scaphirhynchus sp.* larvae (of a total 44,110 total larvae) in intensive vertical composite plankton net sampling at seven cross-channel transects on the Missouri River between Gavin's Point Dam and Leavenworth, Kansas. Fewer than 10 of these larvae were collected at the transect located at FCS. It is highly likely that all of these larvae were shovelnose sturgeon, which were and remain much more common than the pallid sturgeon in the Missouri River, as discussed above.

During the 1970s, documented occurrences of adult pallid sturgeons in the Missouri River per year were reduced by approximately 58% as compared to a more drastic reduction in the 1980s of 86% (55 FR 26641 [FWS 1990]). Despite the relative greater abundance of pallid sturgeons during the OPPD study period, and the subsequent higher potential for spawning to successfully occur, only a few *Scaphirhynchus* sp. larvae were found. It was not possible to identify the collected larvae below the genus *Scaphirhynchus.* Additionally, despite recent pallid sturgeon recovery efforts, evidence of successful reproduction and recruitment throughout its range remain rare. Only three pallid sturgeon larvae have been found in the lower Missouri River. Their relative number to other species of collected larvae suggest that spawning success and larval abundance for the pallid sturgeon remain low (FWS 2000). Given that pallid sturgeon occurrences upstream remain rare, despite recent habitat restoration and population augmentation efforts, and that evidence of successful spawning and larval abundance also remains very low, the NRC staff concludes that a far field larval monitoring program around FCS would not generate any useful data.

The upstream Gavins Point–Ponca reach of the Missouri River may have some potential to support spawning of the pallid sturgeon, because this unchannelized reach exhibits more natural habitat characteristics than does the river downstream, which is channelized (as at FCS). However, spawning substrate is reportedly quite limited, based on observations of Hesse and Mestl (1993) with respect to the paddlefish (*Polyodon spathula)*, which spawns demersal adhesive eggs on coarse substrates in swift current, as is presumed to be the case for the pallid sturgeon (Smith 1979, FWS 2000). In addition, as indicated by FWS in their January 13, 2003 letter (FWS 2003), no pallid sturgeon spawning has been documented in the Missouri River between FCS and Gavins Point Dam, and the specific suitability of the Gavins Point-Ponca reach for pallid sturgeon spawning has not been demonstrated.

Further, it is recognized that the hydrologic regime established under the current water control plan (CWCP) of the USACE, particularly suppression of spring flows, has likely resulted in the loss of spawning cues (i.e., warm water coupled with river stage increases) for the pallid sturgeon (FWS 2000), which would act to reduce or eliminate spawning success even if otherwise suitable spawning habitat is present. The proposed increase of river flows during spring, to produce an artificial spring rise and the potential restoration of a spawning cue for the pallid sturgeon, is one of the most contentious issues surrounding the revision of the Missouri River Master Manual. This involves a recommended additional spring flows of 425 to 566 m^3/s (15,000 to 20,000 cfs) through Gavins Point Dam during the month of May. It is unclear at this time whether such a plan will be implemented (MDNR 2003). While the critical importance of this habitat component is recognized, the magnitude, frequency, and duration of these spawning cues for the pallid sturgeon currently remain unknown, and the USACE has indicated the need for additional research, monitoring, and evaluation to determine appropriate temperature and hydrologic parameters (USACE 2003).

In summary the staff concludes that despite an intensive monitoring program in the 1970s, when the adult population was significantly more abundant, the number of *Scapirhynchus* sp. larvae caught were not sufficient to make any meaningful, and statistically valid, conclusions about the impact of the facility on the pallid sturgeon. Additional site-specific studies at this time would likely yield even less useful data.

3. Additional larval monitoring studies at FCS are unnecessary.

The NRC believes that further monitoring studies at FCS would not be useful in demonstrating whether FCS has any adverse effect on the pallid sturgeon. Monitoring studies of fish impingement and entrainment at FCS and fish populations in the Missouri River, tributary streams, and backwater habitats on and near the FCS site in the 1970s did not specifically document the presence of pallid sturgeon, and no detectable effect on Missouri River fish populations from FCS operation was discerned on the basis of these intensive studies. As noted in the Pallid Sturgeon Recovery Plan (FWS 1993) and broadly stated elsewhere, destruction and alteration of habitats by human modification of the river system are the primary cause of declines in reproduction, growth, and survival of a pallid sturgeon, and it is unlikely that the species can be recovered without restoring these habitat elements, which include morphology, hydrology, temperature regime, cover, and sediment/organic matter transport.

The NRC staff has determined, based on the known distribution of the pallid sturgeon in the Missouri River, the volume of water withdrawn by the station, the extent of the thermal plume, life history information on the pallid sturgeon and related species, and the questionable value of additional larval sturgeon collection studies in the channelized portion of the Missouri River there is no need to conduct additional larval monitoring studies at this time. While the NRC recognizes the critical importance of protecting the pallid sturgeon from possible extinction, the

NRC concludes that implementing such a monitoring study is not needed nor helpful in achieving this goal and is also not needed to assess the impact of FCS's continued operations on the pallid sturgeon and protecting this endangered species. Previous OPPD studies remain relevant and supportive of NRC's conclusion that continued operations of FCS may affect, but is not likely to adversely affect the pallid sturgeon.

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