KGE THE ELECTRIC COMPANY KANSAS GAS AND ELECTRIC COMPANY

GLENN L. KOESTER
VICE PRESIDENT - NUCLEAR

February 15, 1982

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

KMLNRC 82-160
Re: Docket No. STN 50-482
Subj: Geology

Dear Mr. Denton:

Per discussions with the NRC Staff, transmitted herewith are revised FSAR pages which discuss the evaluation of possible faulting indicated by recent Kansas Geological Survey reflection seismic data. It is concluded that evidence of faulting based on the seismic data is not compelling. This information will be formally incorporated into the Wolf Creek Generating Station, Unit No. 1, Final Safety Analysis Report in Revision 9. This information is hereby incorporated into the Wolf Creek Generating Station, Unit No. 1, Operating License Application.

Yours very truly,

Glenn L Koester

GLK:bb
Attach

cc: Mr. J.B. Hopkins (2)
Division of Project Management
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. Thomas Vandel
Resident NRC Inspector
P.O. Box 311
Burlington, Kansas 66839

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OATH OF AFFIRMATION

STATE OF KANSAS)
) SS:
COUNTY OF SEDGWICK)

I, Glenn L. Koester, of lawful age, being duly sworn upon oath, do depose, state and affirm that I am Vice President - Nuclear of Kansas Gas and Electric Company, Wichita, Kansas, that I have signed the foregoing letter of transmittal, know the contents thereof, and that all statements contained therein are true.

KANSAS GAS AND ELECTRIC COMPANY

ATTEST:

W.B. Walker

W.B. Walker, Secretary

By Glenn L Koester

Glenn L. Koester
Vice President - Nuclear

STATE OF KANSAS)
) SS:
COUNTY OF SEDGWICK)

BE IT REMEMBERED that on this 15th day of February, 1982, before me, Evelyn L. Fry, a Notary, personally appeared Glenn L. Koester, Vice President - Nuclear of Kansas Gas and Electric Company, Wichita, Kansas, who is personally known to me and who executed the foregoing instrument, and he duly acknowledged the execution of the same for and on behalf of and as the act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal the date and year above written.

EVELYN L. FRY
NOTARY PUBLIC
STATE OF

Evelyn L. Fry

Evelyn L. Fry, Notary

My Commission expires on August 15, 1984.

located above a topographic low in the Precambrian surface. This topographic low appears to coincide with closely spaced geophysical contour lines (Figures 2.5-7, 2.5-8 and 2.5-9). The Irving Syncline, therefore, may be located above a steeply dipping fault zone which separates the Nemaha Uplift from the MGA maxima (See Section 2.5.1.1.5.1.17).

Initial development of the Precambrian surface configuration beneath the Irving Syncline and Abilene Anticline may have occurred during the Precambrian and would be related to the formation of the Central North American Rift System (Section 2.5.1.1.5.1.17). Initial development of the Abilene Anticline and Irving Syncline may have occurred during late Mississippian to early Pennsylvanian time (Chelikowsky, 1972, p. 3). Following Mississipian deposition, uplift exposed Mississippian limestones to erosion along the crest of the Abilene Anticline. All Paleozoic rocks were eroded from the crest in northern Kansas. Since the anticline plunges to the southwest, the depth of erosion decreases in this direction (Shenkel, 1959, p. 124-126). The seas reinvaded northeastern Kansas during the Middle Pennsylvanian (Desmoinesian). Renewed periods of uplift during the Late Pennsylvanian (Missourian and Virgilian) are indicated by thinning of the Upper Pennsylvanian Lansing, Douglas, Shawnee, and Wabaunsee Groups above the crest of the Abilene Anticline (Merriam, 1963, p. 112, 113, 115, 118). Further uplift related to emplacement of ultramafic intrusions in Riley County may have occurred during the Cretaceous (Section 2.5.1.1.5.2). The crest of the Nemaha Anticline is located several miles east of the axis of the Irving Syncline, which is several miles east of the axis of the Abilene Anticline. The Irving Syncline probably formed passively as a structural low flanked by two tectonically positive structures: the Nemaha and Abilene anticlines. While the Nemaha Anticline may have formed as a result of uplift in the basement, the Abilene Anticline may have formed as a result of passive folding in the overlying sedimentary rocks (Section 2.5.2.2).

2.5.1.1.5.1.16 Local Structures

The small-scale localized structures are shown on Figure 2.5-15 and listed in Tables 2.5-1 through 2.5-6. These structures are associated with each of the large-scale structural basins and arches. The small-scale fold axes and the strike of the faults generally conform to regional trends: N20°E; N40° to 60°W; and N45°E. Limbs of folds generally dip less than 5 degrees. Most faults dip steeply and have normal displacement. The central portion of the regional area is relatively free of folding or faulting.

The smaller-scale features range in shape from domes to elongated synclines and anticlines. Some are symmetrical, some asymmetrical, and many have associated faults. The limbs of many folds appear to dip more steeply with depth, and several are structural traps for oil and gas. The major periods of folding are listed in Table 2.5-7.

The Kansas Geological Survey performed a seismic reflection survey in 1980 along approximately 4.75 miles of an east-west county road crossing the John Redmond Dam. The survey was performed using the Mini-Sosie* technique for 6-fold data. Preliminary data processing in January 1982 and preliminary interpretation by the Kansas Geological Survey indicated the possibility of a faulted small-scale anticline at depth near the southwestern end of the John Redmond Dam (Wilson, 1982, personal communication) at a location approximately 6.4 miles west-southwest of the site. Subsequent review of the preliminary data by Dames & Moore and discussions with the Kansas Geological Survey led to the conclusion that evidence of faulting based on the seismic data was not compelling. Surficial and excavation surface geologic mapping along the make-up water system (Dames & Moore, 1979b; Dames & Moore, 1981) and soils and geology exploration by the U.S. Army Corps of Engineers for the foundation of the John Redmond Dam (U.S. Army Corps of Engineers, 1959) show no evidence of surface faulting within 5 miles west-southwest of the site.

In Woodson and Riley counties, Kansas, igneous plugs have intruded into the Paleozoic sediments. Potassium-Argon (K-Ar) dating of the Woodson County mica peridotites (Rose Dome and Silver City Dome) has given ages of 88 to 91 m.y. (Zartman and others, 1967). Rubidium-Strontium (Rb-Sr) mineral isochron dating of the Stockdale Kimberlite plugs in Riley County (Brookings and Woods, 1970), K-Ar mineral, and fission track dating (Brookings and Naeser, 1971) show that the date of emplacement of these plugs is Cretaceous.

2.5.1.1.5.1.17 Geophysical Anomalies and Structures

Midcontinent Geophysical Anomaly (Rift System) - The Bouger Gravity Anomaly map (Figure 2.5-8) illustrates a marked agreement between azimuths of anomalies and trends of the Nemaha and Central Kansas uplifts (Woolard, 1959, p. 97). A westward shift of the gravity anomaly from the axis of the Nemaha Anticline strongly suggests structural control of intrusions along preexisting fracture zones (Woolard, 1959, p. 102). These positive gravity anomalies are also characterized by pronounced magnetic anomalies, suggesting igneous or metamorphic rocks of mafic composition at depth (Figure 2.5-9 and Woolard, 1959, p. 94). The gravity and magnetic high parallel with the Nemaha Anticline is a continuation of the MGA. This anomaly can be traced for

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*Trademark of Elf-Acquitaine Production.

more than 600 miles from Lake Superior to the Salina Basin in central Kansas and appears to be caused by a sequence of mafic, layered intrusives (and extrusives) and arkosic rocks that are probably fault-bounded and tilted along the margins of the anomaly (Figure 2.5-10).

The Kansas segment of the MGA appears to have been offset 50 miles eastward from its northeastward continuation (Figure 2.5-10). On the basis of magnetic, gravity, and geologic data, King and Zeitz (1971) postulated that the MGA indicates the presence of a Precambrian Rift System. A model of the geophysical anomaly across the Iowa segment shows a fault-bordered basin of mafic rocks approximately 5 miles thick resting on Precambrian basement rocks (King and Zeitz, 1971, p. 2196).

Ocola and Meyer (1973) interpreted gravity, seismic, and geologic data across the MGA to represent the "Central North American Rift System". According to Ocola and Meyer (1973), this density contrast was caused by a mafic mass that has a deep central feeder and a larger volume than that proposed by King and Zeitz (1971) within felsic country rock (Figure 2.5-13). Lyons (1959, p. 117-118) estimated the high density core to be approximately 33 miles in width, but gave no data on its possible vertical extent (Figure 2.5-14).

In summary, northeast- and northwest-trending lineaments are predominant in eastern Kansas. Most northeast-trending lineaments, which correspond with geophysical or Precambrian surface features, are related to the CNARS or Nemaha Uplift Most northwest-trending features appear to be related to Precambrian basement terrane. Curvilinears 23 and 24 appear to correspond with younger Precambrian granites that have intruded older Precambrian terrane. Faulting in the vicinity of Lineaments No. 4, 5, and 6 is discussed in Section 2.5.1.1.5.2 (Faults No. 24). On the basis of current data, the "Neosho Lineament" does not appear to be related to structure in the basement or overlying sedimentary rocks.

2.5.1.1.5.2 Regional Faulting

The distribution of faults within the area of investigation is shown in Figures 2.5-16 and 2.5-17; their characteristics are detailed state by state in Tables 2.5-8 through 2.5-13.

The attitude of faults clusters about three general trends within the region: N20°E, N50°W, and N65°E. The faults tend to be high angle displacements of the Precambrian surface and range from inferred fracture zones with no known displacement to over 3,000 feet. Faults exposed at the surface are mainly the result of tectonic adjustments. Other faults are the result of block slumping, landslides, or penecontemporaneous subsidence resulting from differential consolidation of sediments. No major faults have been confirmed within 15 miles of the plant site.

The age of the faulting is established by determining the age of the oldest stratum which overlies the fault and is not cut by the fault. In those cases where the faulting occurs at the earth's surface, the age of faulting is based on the interpretation of the tectonic history as related to the geologic history.

The N20°E trending Humboldt fault zone in eastern Kansas and Nebraska, the Chesapeake Fault Zone in southeastern Kansas and southwestern Missouri, and the Thurman-Wilson Fault in southeastern Nebraska and southwestern Iowa represent the longest fault zones within the region. The N20°E trending Humboldt fault zone is discontinuous, but traceable, and extends from Oklahoma through Kansas into Nebraska. This feature is apparently the result of crustal adjustments along the eastern side of the Nemaha Anticline. These faults are considered to be Paleozoic in age.

The Humboldt fault zone is a discontinuous series of faults along the eastern margin of the Nemaha Uplift (Section 2.5.1.1.5.1.9). This zone can be traced to approximately 50 miles west of the site at its closest approach (Section 2.5.1.1.5.1.9 and Figure 2.5-7). Examination of the

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