February 11, 1998

NOTE TO: Jim McKnight, Document Control, IRM
MS 0-5-D-24

FROM: Ron Hernan, DRPE

SUBJECT: Docketing of documents received regarding Sequoyah Nuclear Plant

Please place the enclosed documents on the docket for Sequoyah Units 1 and 2 (Docket Nos. 50-327 and 50-328) as well as in the Public Document Rooms for Sequoyah.

Thank You.

Ron Hernan

Ron Hernan
415-2010

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DOCKETS 50-327
50-328

PB/FWA to Ron Hernan

SEQUOYAH NUCLEAR PLANT

JUSTIFICATION OF OPERATING VOLTAGES USED IN GL89-10 EVALUATIONS

The approach that is used by TVA in calculating the minimum expected voltage at the terminals of motor operated valves (MOV) in GL 89-10 program is as follows:

If a MOV is required to operate in automatic mode at onset of an design basis event, the MOV terminal voltage is evaluated to ensure that adequate voltage is available when the MOV is required to operate after the SI phase A or B signal. During this time period the 161kv offsite power supply is conservatively assumed to instantaneously drop from its normal operating voltage of 165 ± 1kv to 153kv (due to postulated worst case transmission system contingency) in conjunction with the block starting of all safety-related loads actuated by the SI phase A or B signal. As a result the 6.9kv Shutdown Board voltage will drop to below the degraded voltage setpoint of 6456 volts to approximately 5850 volts. The automatic load tap changers (LTC) on the Common Station Service Transformers (CSST) will start, after a 2 second time delay, boosting the voltage approximately 1.25% each second until the voltage recovers to within the LTC voltage range of 6997-7107 volts. The voltage will recover sufficiently to reset the degraded voltage relay (6595 volts) within 6 seconds. | 2/9/98

For non-accident (manual-normal operation) MOV's (such as for FCV-68-332, -333) that may need to start and operate after the accident starting transient is over, the steady-state voltage attained due to the automatic LTC action is utilized to ensure that adequate voltage is available. The lowest resulting voltage on any 6.9 Shutdown Board is approximately 6900 volts which still assumes the 161kv offsite power source at 153kv and results in the CSST LTC at its maximum boost voltage tap of 10%. The resulting 480v Reactor MOV Board voltages range from 477-480.7 volts which results in a minimum terminal voltage of 429 volts (93% of MOV rating) at any of the FCV-68-332, -333 MOV's. | 2/9/98

The approach TVA has taken is consistent with IEEE 741-1997, "IEEE Standard Criteria for the Protection of Class 1E Power Systems and Equipment in Nuclear Power Generating Stations" Annex A, "Illustration of concepts associated with degraded voltage protection". IEEE 741 states "the capability to start motors...must be evaluated....at or below the lowest expected preferred power supply voltage. If analysis determines that the bus voltage drops into the degraded voltage relay operating range during a momentary voltage dip, the voltage must recover above the reset value within the time delay period. Additionally, analyses may consider the effects of voltage compensating equipment, such as automatic load tap changing transformers, and automatic switched capacitor banks, including their associated time delays, to ensure bus voltage recovery following expected voltage transients". TVA has evaluated all starting motors at an offsite power supply voltage of 153kv, which is a bounding minimum preferred power supply voltage, and is based on Transmission System Studies (TSS) performed by Transmission/Planning Systems, which have been conservatively performed in accordance with the following criteria:

- Minimum grid voltage is established based on the worst-case combination of one postulated design basis event plus one unrelated simultaneous contingency to determine the availability, capacity, and capability of the offsite power sources to the nuclear units. The design basis event will always consist of an accident in one unit and simultaneous orderly shutdown (not unit trip) of all other units. This is because the accident case will always have the strictest voltage requirements in the plant voltage analyses (especially on the low voltage system). The

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contingency will be the one single failure (or loss) of that part of the transmission system which gives the worst-case results. The selection of contingencies to be considered in the TSS's are in accordance with the guidelines presented in the North American Electric Reliability Council (NERC) standard on Transmission Planning.

- All other transmission system components should be operating normally.

It should be noted that the 153kv assumption is very conservative and would take a pre-existing transmission system contingency plus a design basis event in Unit 2 plus a simultaneous worst case transmission system contingency plus an orderly shutdown of the other unit to drop to that level. For a design basis event plus a simultaneous worst case transmission system contingency with all other ties normal/closed, the 161kv system voltage would only drop to approximately 155kv.

The approach taken by TVA meets the guidelines of the GL 89-10 Action E Question 36, which state that " ..licensees to use the voltage that will be present at the MOV when determining its ability of operate under design-basis conditions. This actual voltage applied to the MOV at the time of operation is often less than the nominal voltage rating of the MOV. Any voltage less than the nominal rating is referred to as degraded voltage". For the case of FCV-68-332, -333 the worst case calculated voltage present at the MOV at the time of operation is approximately 429 volts, which by the GL 89-10 statement above, is at a degraded voltage of 429 volts which is less than the MOV rating of 460 volts. The GL 89-10 document does not require showing that the MOV will operate at the degraded voltage relay setpoint, but at the voltage that will be present at the time of operation, which is the method TVA used.

TVA analyses conservatively used a greatly reduced offsite power supply voltage of 153kv (which is only possible due to a pre-existing transmission contingency plus a simultaneous transmission contingencies all at the same time with an accident in Unit 2 and an orderly shutdown of the other unit). Therefore it is not required to assume additional failures in the offsite power circuits, such as failure of the LTC's. It should be pointed out that, NRC Inspection Report 50-327/94-28 and 50-328/94-28 in 1994 documented a review which found acceptable the methodology for determining the minimum expected offsite voltage. The only GL 89-10 guideline is to be able to show the capability to start motors at or below the lowest expected preferred power supply voltage. TVA has conservatively met these guidelines for the GL 89-10 MOV's.

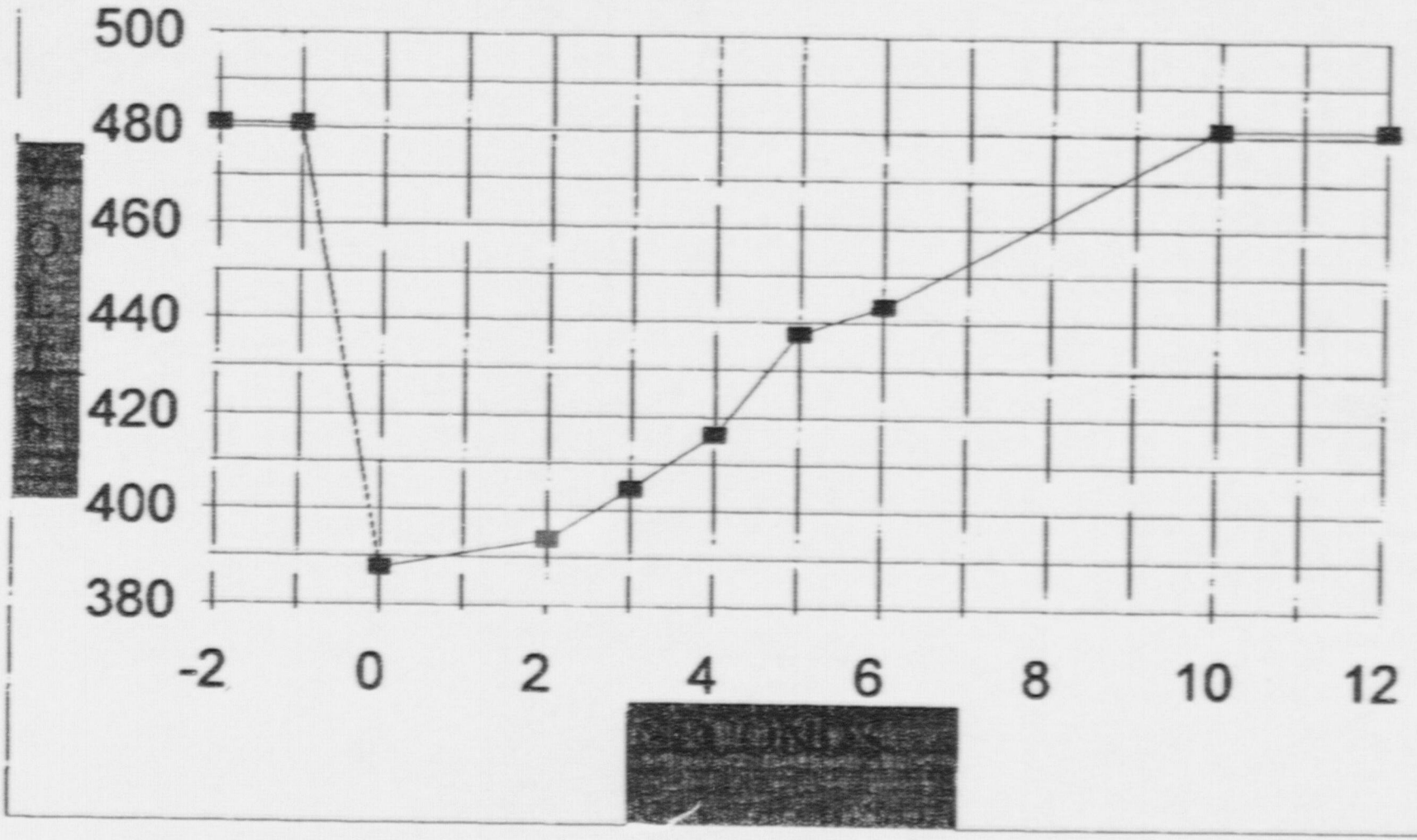
Prepared by: G. L. Nicely 2/9/1998

Reviewed by: RJP

SEQUOYAH

480 V RX MOV BD 1B1-B

VOLTAGE PROFILE FOR SI-PH B



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