REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

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SUBJECT: Forwards addl info re mods to degraded voltage protection logic & diesel generator start logic.Info intended to suppl 831230 analysis,840727 license amend request & Attachment I of 840925 ltr.

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Washington, DC 20555

MONTICELLO NUCLEAR GENERATING PLANT
Docket No. 50-263 License No. DPR-22

Additional Information Related to Modifications to Degraded Voltage Protection Locic and Diesel Generator Start Logic

On December 30, 1983 Northern States Power Company submitted a re-analysis of the adequacy of station distribution system voltages. On September 25, 1984 we submitted additional information requested by the NRC Staff related to this analysis and certain modifications we committed to make to the degraded voltage protection logic and the diesel generator start logic. A License Amendment Request imposing a more conservative degraded voltage logic setpoint was submitted on July 27, 1984. The purpose of this letter is to document additional information which was provided by telephone to Mr John Emani of the Power Systems Branch during review of these items earlier this month.

The attached information is intended to supplement our earlier correspondence:

a. Page 4 of our December 30, 1983 analysis has been corrected to reflect the comments of Mr Emani with respect to diesel generator operations.

b. The Tables presented on page 3 of the attachment to our License Amendment dated July 27, 1984 have been corrected. The deviations expressed in these tables are stated in terms of per unit percentage.

c. Two errors on page 3 of Attachment I of our September 25, 1984 submittal have been corrected.

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d. Two pages of our July 27, 1984 License Amendment Request will be amended. Table 3.2.6 will be revised to explicitly include an allowable relay setting band. This is done with the other set-points in the Section 3.2 tables. The table of allowable deviations will be revised to be consistent with these changes and provide more realistic deviations for the loss of voltage relays. The affected pages are attached for preliminary NRC Staff review.

Please contact us if you have any questions related to the attached information.

David Musolf
Manager - Nuclear Support Services

DMM/dab

c: Regional Administrator-III, NRC
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Attachments

The diesel engine-generator units are a standard design with engine, generator, electrical controls and auxiliaries all mounted on a common base. Output is rated at 2500 kW (3125 KVA @ .8PF), 4160V, three phase, 60 Hz ac. Protective relays are provided to prevent loading the generator until the diesel engine has accelerated to operating speed. Voltage and speed regulators are provided as well as overload alarms. Overloads or ground faults do not cause automatic trip out of the generator circuit breakers. Operators will adjust loads if the overload alarm indicates a need. The diesel generators are rated for 10% overload for 2000 hours or 22% overload for 30 minutes out of each 24 hours. Protective relays initiate tripping of the generator circuit breakers and the engine for differential overcurrent, phase fault or reverse power. An automatic overspeed trip device is the only mechanical device which will trip the diesel engine.

The generators are Y connected with the neutral of each grounded through special transformers with ground current monitors provided. Voltmeters, ammeters, and wattmeters are provided to permit monitoring the loading of each unit. Equipment is provided for manually synchronizing the generators with the incoming a-c power lines for test purposes. Automatic synchronization capability is not provided. Each diesel generator unit is so loaded and of such capacity that, even if only one unit operates, safe shutdown of the reactor is assured, even under design basis accident conditions.

Each diesel generator is designed to start automatically, and within 10 seconds begin to accept sequenced load (see 2.4.4). As shown in this section, pump motors are started at five second intervals. The diesel generator and its control system are designed to maintain output voltage above 70% of rated voltage upon the application of any of these pump motor loads including the running load at the instant of connecting each successive load. Voltage will be restored to within 87% in 1 second and 98% within 1.7 seconds.

The diesel generators are each capable of starting and carrying the largest vital loads required under postulated accident conditions. After the automatic start sequence is complete, the generator may be manually loaded to its rated capacity at the discretion of the operator. Alarms are provided which will annunciate an overloaded condition; however, the generator load will not trip when the generator becomes overloaded. Operator action will correct the overload condition.

Although an automatic start of the diesel generator has been initiated, there may have been no loss of voltage on the essential buses, or an automatic transfer to another source may have been effected, in which case the running generators are held in reserve during the emergency period.

If the essential buses are still de-energized when the diesels have accelerated, automatic relaying will remove unnecessary loads and disconnect the essential buses from the normal auxiliary system. If

TABLE 1

Comparison To Model For Initial and Final Conditions

	Initial Conditions			Final Conditions		
Bus #	Test	Model	% dv	Test	Model	% dv
115 KV	119.7 KV	119.7 KV	0	119.3 KV	119.3 KV	0
11	4080	4068	0.28	4050	4049	0.02
12	4070	4069	0.02	4040	4049	0.22
13	4200	4230	0.72	4190	4180	0.24
14	4190	4231	0.99	4180	4180	0.0
15	4220	4230	0.24	4210	4179	0.75
16	4220	4230	0.24	4210	4180	0.72
LC 101	485	488	0.63	484	482	0.42
102	484	482	0.42	481	477	0.83
103	476	471	1.04	470	465	1.04
104	484	482	0.42	482	476	1.25
MCC 133A	468	466	0.42	463	460	0.63
*Y10	112.5	113.5	0.83	111.0	112.0	0.83

TABLE 2

Comparison To Model For Specific 1E Buses

Cases Modeled		Bus 15 Volts	LC 103 Volts	MCC 133A Volts	Y10 Instr. AC Volts*
Initial Conditions	Test	4220	476	468	112.5
119.7 KV Source	Model	4230	471	466	113.5
Steady State	% dv	0.24	1.04	0.42	0.83
#12 Cooling Tower	Test	3898	435.3	428.6	102.7
Pump-Start	Model	3951	438	432	105
	% dv	1.27	0.56	0.71	1.92
#12 Cooling Tower	Test	4252.5	475.1	467.0	112.1
Pump Running	Model	4201	468	463	112.7
	% dv	1.24	1.48	0.83	0.50
#12 Cooling Tower	Test	4239.4	472.3	464.1	111.4
Pump Running,	Model	4189	466	461	112.2
119.3 KV Source	% dv	1.21	1.31	0.65	0.67
#11 Core Spray Pump	Test	4095.0	455.5	449.0	107.6
Start	Model	4092	455	449	109.2
	% dv	0.07	0.1	0.0	1.33
#11 Core Spray Pump	Test	4226.2	470.4	462.9	111.0
Running	Model	4179	465	460	112.0
	% dv	1.13	1.13	0.60	0.83

*Instru AC volts are not an output of the model; however they are calculated based on known transformer losses and tap settings.

settings for the 1AR transformer. Tap "B", 14,000/4,330, is the correct tap position. It was also noted that figures 15, 16 and 17 are incorrect; the wrong tap position is shown on these plots. Corrected plots are provided in attachment 2.

We also changed our assumption on minimum voltage for the 1AR transformer. The original minimum voltage was based on a minimum load, minimum source condition. However, since this transformer is normally in standby, it should be maintained in a condition to accept the LOCA load if called upon. Using this assumption, the lower limit on the 345 KV grid changes from 340 KV to 342 KV.

QUESTION

6. Provide details of the design changes described in your report for staff review. Also provide a copy of the revised Technical Specifications for staff review.

RESPONSE

The design changes committed to in our re-analysis of the station auxiliary electrical distribution report are described below. Revised Technical Specifications were submitted on July 27, 1984.

I. Instrument Transformer Tap Change:

The instrument transformers identified in Table 5 of the above mentioned report will have the high side tap moved from the 480V to the 456:120 position.

II. Replacement of the Degraded Voltage Relays:

The original ITE-27D undervoltage relays were replaced with the tighter tolerance higher precision ITE-27N undervoltage relay.

III. Degraded Voltage Transfer Scheme:

The degraded voltage transfer scheme was modified to transfer essential safeguard buses No. 15 & No. 16 on a degraded voltage condition to the preferred off-site standby reserve transformer if it has acceptable no load voltage. The absence of acceptable voltage would result in completion of the transfer to the emergency diesel generator. Also, a degraded condition on the preferred off-site standby reserve transformer after transfer to it would result in a degraded voltage transfer to the emergency diesel generators. In addition, this sampling of the no load voltage of the preferred off-site standby reserve transformer has no effect on the existing time sequence for transfer to the emergency diesel generators.

IV. Emergency Diesel Generator Start Logic:

The existing fast start logic of the emergency diesel generators will be modified to reduce the number of initiation signals, see figures 2 & 3. The modified logic will automatically fast start the diesels for only:

Table 3.2.6

Instrumentation for Safeguards Bus Degraded Voltage and Loss of Voltage Protection

Function	Trip Setting	Minimum No. of Operable or Operating Trip Systems (1)	Total No. of Instrument Channels Per Trip System	Minimum No. of Operable or Operating Channels Per Trip System (1)	Required Conditions
1. Degraded Voltage Protection (3)	3915 ± 18 volts 9 ± 1 sec	1/bus	3	3	A
2. Loss of Voltage Protection (2)	2625 ± 175 volts No intentional delay	2/bus	2	2	A

NOTE:

1. Upon discovery that minimum requirements for the number of operable or operating trip systems or instrument channels are not satisfied, action shall be initiated to:

   a. Satisfy the requirements by placing the appropriate channels or systems in the tripped condition, or

   b. Place the plant under the specified required conditions using normal operating procedures.

2. One out of two twice logic.

3. Two out of three logic.

* Required conditions when minimum conditions for operation are not satisfied:

   A. Cold shutdown within 24 hours.

	Trip Function	Deviation
Instrumentation That Initiates Emergency Core Cooling Systems Table 3.2.2	Low-Low Reactor Water Level	-3 Inches
	Reactor Low Pressure (Pump Start) Permissive	-10 psi
	High Drywell Pressure	+1 psi
	Low Reactor Pressure (Valve Permissive)	-10 psi
Instrumentation That Initiates Rod Block Table 3.2.3	IRM Downscale	-2/125 of Scale
	IRM Upscale	+2/125 of Scale
	APRM Downscale	-2/125 of Scale
	APRM Upscale	See Basis 2.3
	RBM Downscale	-2/125 of Scale
	RBM Upscale	Same as APRM Upscale
	Scram Discharge Volume-High Level	+ 1 gallon
Instrumentation That Initiates Recirculation Pump Trip	High Reactor Pressure	+ 12 psi
	Low Reactor Water Level	-3 Inches
Instrumentation for Safeguards Bus Protection	Degraded Voltage	$\geq$3897 volts (trip) $\leq$3975 volts (reset) $\geq$5 sec $\leq$10 sec (delay)
	Loss of Voltage	$<$3000 volts $>$2000 volts

A violation of this specification is assumed to occur only when a device is knowingly set outside of the limiting trip settings, or, when a sufficient number of devices have been affected by any means such that the automatic function is incapable of operating within the allowable deviation while in a reactor mode in which the specified function must be operable or when actions specified are not initiated as specified.