A STUDY OF THE NECESSITY TO PERFORM AN ODYN REANALYSIS ON CLINTON POWER STATION

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July 9, 1981

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Revision 1

11/20/81

PURPOSE

The purpose of this study is to compare the Clinton Power Station (CPS) and the RiverBend Nuclear Power Station (RNPS) reactors to determine whether they are sufficiently identical to justify the application of the RNPS ODYN transient analyses to CPS.

BACKGROUND

ODYN and REDY are both computer codes developed by General Electric (GE).

The CPS-FSAR Chapter 15 transient analyses have been performed using results from the REDY computer code. The Nuclear Regulatory Commission (NRC) is now accepting the use of the ODYN computer code for pressurization transients. Table 1 shows the seven most limiting transients for CPS.

RESULTS (Part I - ΔCPR)

The parameters listed in Table 2 are those parameters which are significant regarding the transient events under consideration in this report.

A comparison of the data in Table 2 shows that RiverBend Nuclear Power Station and CPS differ in only four parameters. A discussion of these differences is given below:

Reactor vessel size - The difference in reactor vessel size is six inches in the height of the vessel. Since the diameters are the same, this six inches would only make a difference of 0.7% in the vessel volume. This difference is not significant.

Turbine Bypass capability - The 35% turbine bypass capability for CPS means that any transient involving turbine bypass will be less severe for CPS than for RNPS.

SRV discharge capacity - The difference in the SRV discharge capacities is small but will result in a small reduction in severity for CPS during any transient involving an SRV discharge.

Rated void fraction - The difference in the rated void fraction is approximately one percent. This one percent difference is not large enough to be considered significant in the calculation of ΔCPR.

Of the four differences discussed above, the only significant difference is the Turbine Bypass Capability. This difference is conservative for CPS if the RNPS results are applied to CPS.

The RNPS-FSAR Chapter 15 transient analysis has been performed using the ODYN code. A comparison of the RNPS-ODYN and CPS-REDY results for the transients shown in Table 1 is given in Table 3.

Regardless of whether the REDY analysis or ODYN analysis results are used, the limiting transient, in terms of ΔCPR, remains the Loss of Feedwater Heater with Manual Flow Control (LFHMFC). The LFHMFC is a relatively slow transient which does not result in a significant pressure increase and is therefore not analyzed by ODYN. Rev. 1

RESULTS (Part II - Reactor Vessel Peak Pressure)

The parameters listed in Table 2 are also significant regarding the peak reactor vessel pressure transient under consideration in this report (MSIV closure-flux scram).

The comparison of the Table 2 data provided in Part I - ΔCPR is also applicable to the peak reactor vessel pressure transient.

The peak reactor vessel pressure for the MSIV closure-flux scram transient for CPS (predicted by REDY) is shown in Chapter 5 of the CPS-FSAR as approximately 1300 psig. The peak reactor vessel pressure for the MSIV closure-flux scram transient for RNPS (predicted by ODYN) is shown in Chapter 5 of the RNPS-FSAR as approximately 1270 psig.

FINDINGS

An ODYN analysis has already been performed for the RNPS and an ODYN analysis for the CPS would yield the same, or less severe results, as this already completed analysis.

There are no detrimental safety or operational implications if the RNPS ODYN analyses is used for CPS because:

a. the limiting ΔCPR transient will remain the LFHMFC which is not analyzed by ODYN and

b. the pressure for the limiting peak reactor vessel pressure transient is less than the peak pressure predicted by REDY for which CPS is already analyzed.

Based on the information presented in this report, an ODYN analysis on Clinton need not be performed.

Table 1

The Seven Most Limiting Transients for CPS

1. Load Rejection Without Bypass,
2. Load Rejection With Bypass,
3. Feedwater Control Failure,
4. Loss of Feedwater Heater with Manual Flow Control,
5. Turbine Trip Without Bypass,
6. MSIV Closure - Flux Scram, and
7. Pressure Regulator Down Scale Failure.

CONCLUSION

The Clinton Power Station and the RiverBend Nuclear Power Station are very nearly identical as far as parameters significant to the seven transients listed in Table 1 are concerned. Any differences in the CPS and RNPS design will result in less severe consequences for CPS. Therefore, for a given transient the results of an ODYN analysis performed on CPS would necessarily be the same, or less severe, as the ODYN analyses performed on RNPS. Since a CPS-specific ODYN analyses would be the same, or less severe, for a given transient than the RNPS ODYN analyses, the RNPS ODYN analyses would be conservative when applied to CPS.

Even though the ΔCPR results of a given transient may differ between the RNPS ODYN analysis and a CPS ODYN analysis (if performed), the limiting transient would remain the same. This limiting transient would not change because it is not required to be analyzed by ODYN. | Rev. 1

Table 2

CPS vs. RNPS Parameter Comparison

Parameter	CPS	RNPS
Reactor Type	BWR-6	BWR-6
Reactor Vessel I.D.	218 in.	218 in.
Reactor Vessel Size	18'2" x 69'4"	18'2" x 69'10"
Steam line volume	3275 ft^3	3275 ft^3
MSIV closure time	3-5 sec	3-5 sec
Control valve closuretime	.07 sec	.07 sec
Core flow	84.5 x 10^6lbm/hr	84.5 x 10^6lbm/hr
Turbine bypass capability	35%	10%
Scram time	fast scram	fast scram
Power level	2894MW(th)	2894MW(th)
Dome Pressure	1040 psia	1040 psia
SRV discharge capacity	13.9 x 10^6lbm/hr	13.6 x 10^6lbm/hr
Fuel Assemblies	624	624
Recirc. pipe size	20 in.	20 in.
Stop valve closuretime	.1 sec	.1 sec
Void reactivity		
power increase	-14¢/%void	-14¢/%void
power decrease	-4¢/%void	-4¢/%void
Steam flow	13.07 x 10^6lbm/hr	13.07 x 10^6lbm/hr
Core leakage flow	11%	11%
Core safety limit		
first core	1.06	1.06
reload	1.07	1.07
Doppler coefficient	-.132¢/^{0}F	-.132¢/^{0}F
Total scram reactivity	-$37.05	-$37.05
SRV setpoints		
low pressure group	1 vlv. 1103 psi	1 vlv. 1103 psi
medium pressure group	8 vlvs. 1113 psi	8 vlvs. 1113 psi
high pressure group	7 vlvs. 1123 psi	7 vlvs. 1123 psi
APRM setpoint	118.8% NBR	118.8% NBR
Max Feedwater flow	3631 lbm/sec	3631 lbm/sec
Rated void fraction	43.08%	42.53%
Feedwater temperature	420^{o}F	420^{o}F
Relief valve characteristic		
sensor and logic delay	.3 sec	.3 sec
valve delay	.1 sec	.1 sec
valve stroke time	.15 sec	.15 sec
Safety valve characteristic		
valve stroke time	.3 sec	.3 sec