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Figure 4- 24 Vertical displacements of Cold Leg and Hot Leg pipes (Units: Inches)

5.0 CONCLUSIONS

Steam explosion is a remaining risk-significant issue in nuclear power plant due to the threatening of integrity of the defense-in-depth barriers by explosive dynamic loadings that could lead to release radioactive fission product to public.

Therefore, it is needed to evaluate steam explosion risk when a new design reactor like APR1400 is considered. The steam explosion risk can be categorized into two groups in terms of the locations of steam explosion initiation, that is, in-vessel and ex-vessel.

In this report, comprehensive analyses on both in-vessel and ex-vessel steam explosion were conducted and the most updated technical information on the phenomena, risk evaluation, and analysis methodology were collected and utilized for the assessment of steam explosion risk in the APR1400 design.

The report describes the analysis efforts by selecting the base case adequate to the APR1400 design and examining the ranges of key parameters and their uncertainties. The analysis results can be used for the evaluation of structure integrity relevant to the steam explosion issue in the APR1400 design, especially in the case of ex-vessel severe accident progression.

Table 5-1 summarizes the results of the analysis for the IVSE and EVSE energetics in the APR1400 plant. This analysis concluded that IVSE provided no threat to fail RPV. For the EVSE analysis, reactor cavity structure with EVSE pressure loading is evaluated using LS-DYNA and the maximum displacements, concrete cracks, liner plate stresses, reinforcement re-bar stresses, RPV column support anchor bolt stresses and strains for EVSE loading to reactor cavity are summarized in Table 4-17.

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Table 5- 1 Summary of the IVSE and EVSE Analysis for the APR1400

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