
Westinghouse Activities to Support on Risk-Informed Appendix G

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Westinghouse Analysis to Risk Inform Appendix G

- Plants Analyzed
- Codes Utilized
- Parameters for PWR Sensitivity Study
- Test Matrix
- Typical Cooldown Analyzed
- Results for PWR Plants
- Preliminary Conclusions

Westinghouse Analysis to Risk Inform Appendix G

PWR Plants Analyzed

- ***Seabrook***
- ***Salem 2***
- ***Calvert Cliffs 1***
- ***Kewaunee***
- ***Beaver Valley 1***
- ***Indian Point 3***

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Computer Codes Utilized

- VFLAW - Plant-specific Weld and Plate Flaw Distributions per NUREG/CR-6817 Rev. 1 (PTS Risk Study)
- OPERLIM - Approved Westinghouse Method for Heat-up/Cool-down Limits
- FAVLOAD - Pressure and Thermal Stresses
- FAVOR 6.1 Revision 2 - Probabilistic Fracture Mechanics Analysis with Trend Curve for Proposed Voluntary PTS Rule 10CFR50.61a

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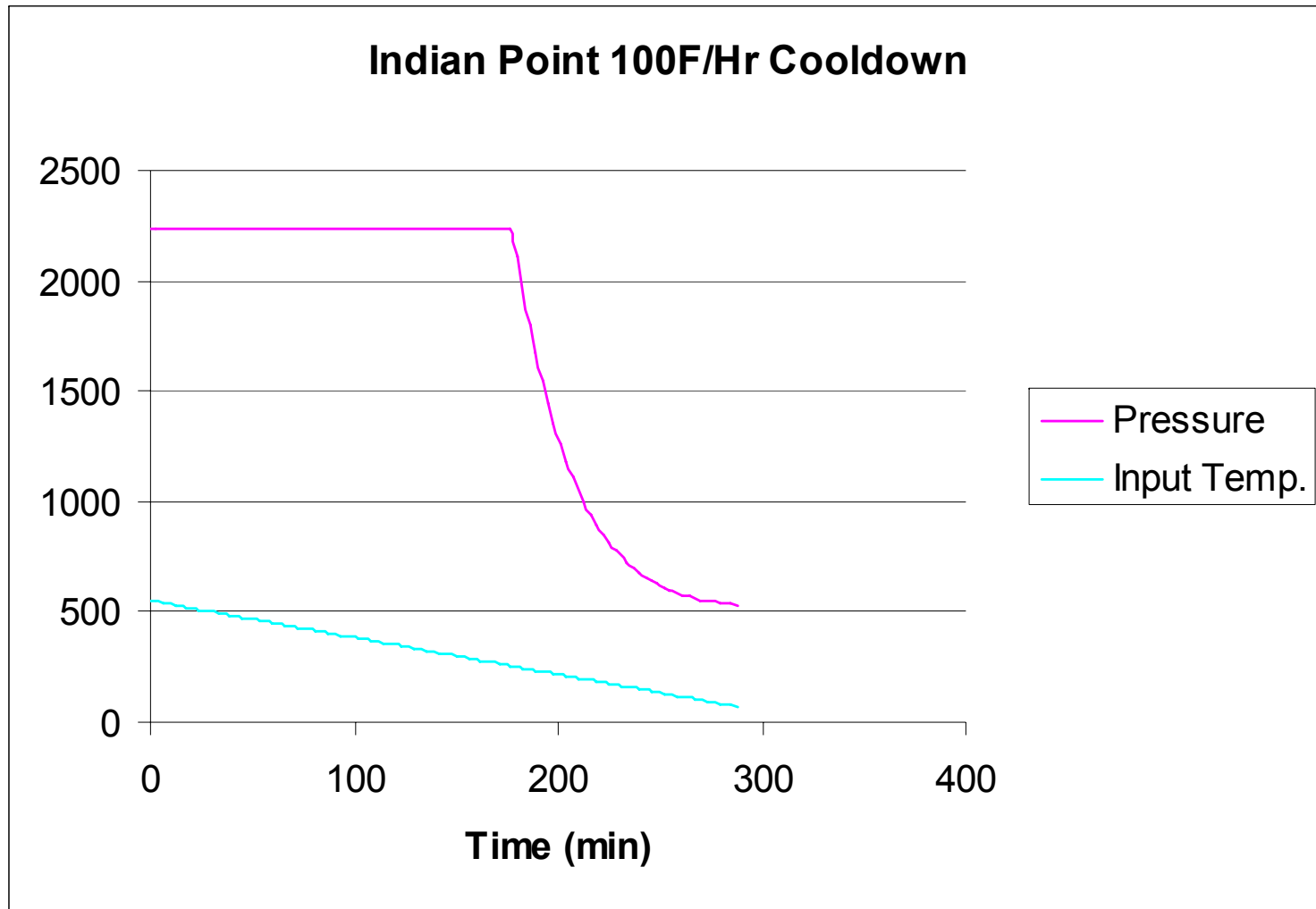
Parameters for PWR Sensitivity Study

- Warm Prestressing
- Plant-specific Embedded Flaw Distributions
- Cooldown Rates of 100°F/Hr and 60°F/Hr
- Margins of 0°F and 60°F on Irradiated RT_{NDT}
- Margin of 1.0 and 1.5 on K_{IM}
- 54 EFPY Fluences

Test Matrix

Test Sequence	WPS	Surface Flaws	Margin on K_{Im}	Margin on RT_{NDT} ($^{\circ}F$)	Cool-down rate ($^{\circ}F/hr$)
Case 1	Yes	No	1	0	100
Case 2	Yes	No	1	60	100
Case 3	Yes	No	1	60	60
Case 4	Yes	No	1	0	60
Case 5	Yes	No	1.5	0	100
Case 6	Yes	No	1.5	0	60

Typical Cooldown Analyzed



Results from Westinghouse Sensitivity Study for PWR Plants

Plant	Margin on K_{in}	Margin on RT_{NDT} ($^{\circ}F$)	Cool-down rate ($^{\circ}F/hr$)	P min (psi)	CPI	CPF	Time to Shelf (min)	% CPF at Shelf Time	Time to 10% - 100% CPF (min)
Beaver Valley 1 Case 1	1	0	100	724	2.7E-9	1.6E-11	183	100	126
Beaver Valley 1 Case 2	1	60	100	689	2.8E-9	1.6E-11	147	100	126
Calvert Cliffs 1 Case 1	1	0	100	552	2.9E-9	9.5E-10	186	100	135
Indian Point 3 Case 1	1	0	100	532	3.4E-7	2.1E-7	177	100	114-138
Indian Point 3 Case 2	1	60	100	498	3.4E-7	2.1E-7	144	100	114-138
Indian Point 3 Case 3	1	0	60	796	0	0	230	-	-
Indian Point 3 Case 4	1	0	60	821	0	0	290	-	-
Indian Point 3 Case 5	1.5	0	100	354	3.4E-7	2.1E-7	162	100	114-138
Kewaunee Case 1	1	0	100	530	0	0	147	-	-

Preliminary Conclusions For These Cases

- It is feasible to increase allowable pressure by risk-informing ASME Section XI, Appendix G and remain below the failure frequency goal.
- Goal can be met with a Margin on K_{IM} of 1.0 and a Margin on irradiated RT_{NDT} of 0°F when considering the effects of warm-prestressing.