Draft BWR Issue Management Table

Equipment	Material	Failure Mechanism	Consequences of Failure	Mitigation	Repair / Replace	I & E Guidance	Gaps	Priority & Basis	Responsible Program(s)
BWR Recirculation piping	SS (lc and hc), Inconel welds	SCC, fatigue	Leakage, forced outage	Yes, chemical and stress improvement	Yes, replace pipe or weld overlay	Yes, BWRVIP-75		Low – solution available	BWRVIP, WCC
BWR Vessel	Cs/las, ss clad, welds	IGSCC, IASCC, TGSCC, FIV, Th & Env Fatigue, Emb, Th aging, Fluence	LOCA – loss of asset	Yes – HWC, NMCA	Yes – nozzle repair	Yes – covers embrittlement and weld degradation		Low – solution available	BWRVIP
BWR Internals	Ss, cass, cs, welds, Inc	IASCC, IGSCC, FIV, Wear, EF, Emb, Fluence – R&D needed	Core configuration	Yes – some, work needed	Yes – shroud and top-guide, costly – work needed	Yes (interim) – 13 BWRVIP I&E Guidelines – work needed		High – existing and potential unresolved issues	BWRVIP, WCC, FRP, Corrosion Research
Core Shroud	Stainless Steel	IGSCC, IASCC, Reduction in Toughness	This is a function of location. Vertical weld flaws have minor significance unless the intersecting circumferential weld is flawed through-wall. Very flaw	Hydrogen Water Chemistry at moderate levels can protect the shroud at lower levels and some benefit is available at higher levels in some plants. When augmented with Noble Metals, more shroud protect is	The repairs to date have been mechanical clamps that replace some or all of the circumferential welds. This is accomplished by developing high compressive loads on the shroud which	BWRVIP has developed a series of inspection guides that have been combined into one overall document (BWRVIP-76). This	Fracture toughness decrease with increasing fluence and there is limited data to help the industry understand long	High priority items for the shroud still exist. Initially was the number one priority. With programs in place for inspection, the needs for	BWRVIP with the Assessment Committee leading

			tolerant for circumferential flaws. Significance of circumferential weld flaws is based on location of the weld. Limiting accident scenario is main steam line break coupled with an earth quake. Even then, shroud circumferential welds were shown to perform adequately with 90% through wall flaw, 360° in circumference. It is worth noting that should a flaw develop for the full circumference, the shroud would lift enough to “burp” itself	possible due to the need for les hydrogen due the to the catalyst effect of the noble metals. Plant-specific assessments are needed to determine the exact level of protection. Other methods of protection are being investigated/considered such as water jet peening etc.	negates the need for the circumferential welds. This provides significant redundancy since no circumferential welds to date have come near a 360 degree through-wall flaw. Repair by welding is very limited in prospect due to difficulty in welding on highly irradiated stainless steels.	document includes inspection criteria for circumferential and vertical welds, and support ring welds, The criteria also address both repaired and unrepaired shrouds including repair hardware. The evaluation criteria exist for all locations and is based on long standing ASME criteria including safety factors. Evaluation methods also account for the changes in crack	term issues. Work is underway to develop additional data prior to the shrouds reaching fluence levels of concern. Similarly, work is underway to properly understand and characterize crack growth behavior in highly irradiated stainless steels.	the shroud are reduced.	

			and provide operators with an indication of a problem and allow safe shutdown.			growth rate and fracture toughness a irradiation damage increases. The methods also allow for crack growth to be adjusted based on water chemistry, residual stresses, changing K values, etc.			