Enclosure 1: Industry Comments on the RASP Handbook

Section	Comment	Suggested Resolution
General Comment	The RASP handbook is intended to cover analysis methods for SDP Phase 3, ASP, MD 8.3 determinations. However, the methods included often seem to be more applicable to ASP and MD 8.3 where conservative judgments are appropriate rather than the Phase 3 SDP process which should be more realistic.	Provide clarifying notes for sections describing conservative methodologies. For example, the discussion of "Modeling component failures from unknown or 'random' cause in Saphire/GEM" should note that this conservative treatment of component failures is appropriate for ASP and MD 8.3 determinations, but more detailed analysis to differentiate between common-cause and independent failures should be performed for Phase 3 SDP.
Repair Time Definition, Page 2-1	The definition includes the phrase "when the component was placed back into service." This time can be interpreted several ways. Some might consider the component "placed back into service" when it is made functional following maintenance. Others would consider it "placed back into service" only after completion of any surveillance testing required to clear an associated LCO. These times can be quite different.	Provide a definition of "placed back into service" to ensure consistent interpretation. A suggested definition would be "the time at which a component is first made functionally available following repair (i.e., the time at which any clearance tagging associated with the repair are removed and the component is considered capable of performing its intended function pending successful surveillance testing)."
3.4, Second Bullet "Potential for Common Cause"	The background on CCF is insufficient to guide the reader to ensure that events are properly categorized. Adding a discussion listing the types of failures (independent, random or common cause) to emphasize the role of root cause analysis would help make categorization more consistent.	Revise the relationship formula as follows: P(CCF | actual common-cause failure) > P(CCF | unknown failure) > P(CCF | Independent) However, it should also be remembered that: P(Independent | unknown failure) > P(CCF | unknown failure) This is based on historical data which shows that the occurrence

		of common-cause failures is much less frequent than the occurrence of independent failures. Therefore, care should be taken in applying CCF adjustments to observed events in the SDP process. It should also be remembered that CCF involves not only the mechanism leading to the failure, but also the timing of the failures. Therefore, the potential for near-term failure of the redundant component due to the same cause as the observed failure must be considered in assessment of the potential for CCF. Add the following paragraph after the equation at the bottom of Page 3-6: The determination for CCF potential can be performed in two phases. The first phase involves the identification of the root cause or symptoms that lead to component failure or degradation. The root cause or symptoms can be identified through a formal process by a team that is cognizant of the component design, function, operating environment, operational and maintenance practices, and human interactions. This will allow the team to identify the root cause or symptoms as one of the following categories and eliminate others that do not apply, based on the evaluation of related information leading to the component failure or degradation. For a well-understood cause with no potential for CCF, the event should be classified as an independent failure. For causes that are not well-understood, there is always a potential for CCF and such events should be classified as random failures.

3.4, Page 3-7, Second to last paragraph	The guidance in this section steers the reader towards considering a failure to be considered common cause instead of independent by requiring the analyst to find proof that no CCF mechanisms are involved to classify a failure as independent. This is likely to result in events inappropriately being classified as CCF.	In the first sentence, remove capitalization from "only" and change "there is no likelihood" to "it is unlikely." Testing and inspection of the redundant components in the common cause group should be acknowledged as valid means of establishing that a common cause failure due to the same causes present in the observed failure are unlikely.
3.4, Page 3-7, Second to last paragraph	This section asserts that "root cause analyses may be in error," and should be revised to avoid indicating to the reader that the conclusions for all root cause analyses are to be suspected as inaccurate.	Revise the second sentence of the paragraph to read "Note that root cause analyses, while an important step in distinguishing between events which are independent (cause well-understood) and which are random (cause not well-understood), are often completed under time pressure and should be reviewed accordingly.
3.4, Page 3-8	The analyst is directed to use the nominal CCF probability for the remaining components in the CCF groups for independent failures, which is illogical given the criteria for classifying an event as independent.	Revise the criteria for independence as suggested above.

Chapter 6, general	Although the amount of recovery credit given for a potential recovery action typically depends on the type of initial failure, the RASP Handbook does not explicitly discuss such considerations	Add a summary of initial failure events and associated potential recovery at the end of Section 6.2. The below table gives an example of such events and associated actions.	
		Examples of Initial Failure Event(s)	*Potential Recovery Action*
		Automatic actuation fails	Manual actuation
		Operator fails to recognize the need to take action (diagnosis failure)	Additional cues or re-visitation
		Test and maintenance unavailability	Restore to service (if Tech Spec inoperable for the test/maintenance but can be returned to service quickly)
		Failure on demand (electrical, (e.g. fuse or other electrical fault which can be recover)	Replace fuse or if a control power problem, locally manually shut the breaker
		Failure on demand (mechanical)	Use redundant SSC or a functionally similar component; or repair
		Failure to run	Similar electrical / mechanical considerations as in failure on demand
		System level failure (e.g. loss of CCW system or loss of offsite power as an initiating event)	Empirical system recovery data

Chapter 6, general	Throughout Chapter 6, the reader is directed to use SPAR-H for modeling, as opposed to widely-used EPRI methods or other NRC methods such as THERP and ATHEANA. SPAR-H is a simplistic model that provides a first-order approximation of the HEP by scaling performance shaping factors. This may be sufficient for Phase-2 SDP, but for Phase-3, a more detailed approach is typically needed for a best estimate HEP.	Revise the second sub-bullet under "Use of HRA vs. operating experience data" on Page 6-6 to read: "Human reliability analysis (HRA) is best used to model recovery of an actual failure, where the failure mechanism is known and recovery is feasible. SPAR-H can provide a first-order approximation of the HEP by scaling performance shaping factors. For Phase-3 SDP, a more detailed HRA method such as THERP or ATHENA should be used to estimate the HEP.
Chapter 6, general	SPAR-H has many known limitations that are not referenced in the RASP Handbook	Add a footnote to the first paragraph under "Use of HRA vs. operating experience data" on Page 6-6 cautioning the reader on the known limitations of SPAR-H by referencing NUREG-1842 in the discussion on that method.
6.1, First Sentence	As used in Chapter 6 of the RASP Handbook, "recovery" is an ambiguous term that is not clearly defined. The definition offered in the first sentence of Section 6.1 is unclear and uses the term "recovery" in the definition.	Replace the first sentence of Section 6.1 with a list of means by which recovery can be achieved, such as an emergency operating procedure step directing an action in response to an initiating event.
Appendix A, Pages A1-14 to A1-15	This section discusses considerations for updating CCF parameters from the base case SPAR model, but does not include a process for estimating CCF parameters. Guidance on reviewing CCF data sets and use of the data pertinent to the event should be added.	After the first paragraph under "Basic event parameter update – common-cause failure probability," add the following text: Four major tasks can be performed to develop CCF parameter estimates applicable to the operational event being analyzed. These tasks include: **Review CCF data sets** – The purpose of this task is to review available data on CCF events. The data set should only included

		events that are potentially applicable and are the same cause of failure as the operational event being analyzed. **Perform qualitative adjustment** – The purpose of this task is to adjust the data set to account for qualitative differences between the original and target systems by applying an applicability factor. The overall applicability factor can be determined by assessing the type of defenses are in place for the operational event for those potential CCF events that have occurred at other plants. **Perform quantitative adjustment** – The purpose of this task is to adjust the data set to account for differences in CCCG sizes between the original and target systems. Independent failures associated with the data set should also be adjusted, as appropriate, to account for potential CCF events that were removed by the qualitative adjustment task. **Estimate plant-specific CCF parameter** – The purpose of this task is to estimate the CCF parameters that are unique to the operational event being analyzed.
Appendix A, Page A1-16	The CCF parameters should be based only on applicable events that cause the failure (that exists with the same coupling mechanisms). This is of primary importance for operational events classified as random failures; however, the section of Appendix A that discusses common cause modeling only references a short checklist to aid the reviewer in the analysis. While the operational event evaluation may not clearly and distinctly identify the cause of component failure or degradation, it should be able to identify one or more circumstances that did not cause the component failure or degradation. CCF events	Incorporate Table 1: Suggested Checklist for Identifying Components susceptible to CCF by adding the checklist after the second bullet on Page A1-16, or by adding its content to the checklist from Volume 3 of the RASP Handbook referenced in the second bullet on Page A1-16.

	involving circumstances that did not cause the failure or degradation should be excluded from the data set used in the CCF parameter estimates.	
Page A1-16	The RASP Handbook does not discuss quality requirements, such as independent review, for HRA methods.	Add a bullet under "Basic event parameter update – human error probability," on Page A1-16 stating the following: In applications where an HEP is driving the results, the HRA portion should undergo a RG 1.200 review.

Table 1: Suggested Checklist for Identifying Components Susceptible to CCF

#	Susceptibility Considerations	Yes	No
	Is the cause or symptoms for the event well known and impacts a single component? (See Note 1 below)	☐	☐
	Do other components (inter or intra-system) similar to the identified failed component exist? (See Note 2 below.)	☐	☐
	Design Based Similarity		
1	Are other similar components configured and arranged the same way?	☐	☐
2	Do other similar components have the same sub-component or internal parts?	☐	☐
3	Do other similar components have the same requirements for maintenance, test, and/or calibration?	☐	☐
4	Are other components of the same type, size, or model?	☐	☐
	Quality Based Similarity		
5	Do other similar components have the same physical appearance?	☐	☐
6	Are other components made by the same manufacturer?	☐	☐
	Operational Based Similarity		
7	Has the same crew operated the components?	☐	☐
8	Are other similar components governed by the same operating procedure?	☐	☐
9	Do other similar components start/operate for the same time period?	☐	☐
10	Do other similar components exhibit the same mode of operation?	☐	☐
	Maintenance Based Similarity		
11	Do other similar components have the same procedure for performing maintenance, test, and/or calibration?	☐	☐
12	Do other similar components have the same schedule for maintenance, test, and/or calibration?	☐	☐
13	Do other similar components have the same crew for performing maintenance, test, and/or calibration?	☐	☐
	Environment Based Similarity		
14	Are other similar components located within the same area or room?	☐	☐
15	Are other similar components exposed to the same working medium (e.g., borated water, compressed air)?	☐	☐
16	Does the working medium satisfy quality requirements?	☐	☐

Notes:
1. If "Yes" is provided as a response, the event is an independent failure.
2. If yes, identify the group of components that may be susceptible to CCF. Otherwise, the failure is not a potential CCF event.

Judgment will be needed to determine which of the above attributes are applicable. Susceptible components within the same system are referred to as a common cause component group.