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### Review of Common-Cause Failure (CCF) Multipliers

A discussion concerning treatment of shared versus cross-tied components with respect to the common-cause failure (CCF) adjustment values or multipliers occurred at the Mitigating Systems Performance Index (MSPI) working group monthly meeting on November 16, 2005. Based on this discussion, the CCF adjustment value table in NEI 99-02, Appendix F was reviewed for consistency and agreement with recent sources such as WCAP-16464-NP, NEDO-33215, the draft basis documents, and the station blackout NUREG. The following changes to Table 3 in NEI 99-02, Appendix F are recommended:

1. Under the EDG category, the Farley 1/2 entry of 1.25 should be changed to 2. This change is based on the WCAP, draft basis document, and station blackout NUREG interpreting the Farley EDG configuration as a 1 of 3 success configuration for each unit. For such configurations, the rule is to use a multiplier of 2.
2. Under the EDG category, the Peach Bottom 2/3 entry of 2 should be changed to 1.25. A limited review of SPAR models indicated that when diverse emergency power sources (other than the EDGs) are available, the multiplier should be 1.25, independent of the number of EDGs. Peach Bottom 2/3 has 4 swing EDGs. Because all loss of offsite power events in the licensee's risk model are assumed to involve both units, the success criterion is 2 of 4 (1 EDG is needed for each unit), or alternatively, effectively 1 of 3 for each unit. However, because there is a backup hydro turbine generator, the rules indicate that 1.25 should be used. (If there were no diverse backup, then the multiplier would be 2.)
3. Under the HRS category, the Turkey Point 3/4 entry for MDPs of 1.25 should be changed to 1. Based on the WCAP and the draft basis document, HRS for these plants includes AFW (3 TDPs) and a backup to AFW termed SSGFP (1 MDP and 1 DDP). Therefore, the combined HRS for these plants includes 1 MDP, 3 TDPs, and 1 DDP per unit. Because there is only 1 MDP, the CCF multiplier is 1. (However, the MDP is currently not in-scope so the change is moot.)
4. From the NEDO and the draft basis document, Nine Mile Point 1 has 4 totally redundant trains of suppression pool cooling, which differs from Unit 2 which has only 2 redundant trains. The CCF multiplier of 1.5 for RHR MDPs for Unit 1 should be changed to 3 consistent with the rule for BWRs.
5. From the NEDO and the draft basis document, Oyster Creek has 4 redundant pumps capable of providing suppression pool cooling, instead of the 2 assumed when the table was generated. The CCF multiplier of 1.5 for RHR MDPs should be changed to 3 consistent with the rules for BWRs.
6. The CCF multipliers for all PWR RHR MDPs are 1.5. South Texas 1/2 should be changed from 2 to 1.5 for consistency.

Note that the discussion during the MSPI monthly meeting also questioned whether cross-tied components should be considered when determining the CCF multiplier. The specific example discussed was Calvert Cliffs 1/2 HRS. For each unit, the HRS includes 1 MDP assigned to the unit in question, 1 cross-tied MDP (from the other unit), and 2 TDPs assigned to the unit in question. For each unit, only 1 MDP is "monitored." However, in the SPAR model, both MDPs are included (with an operator action to align or cross-tie the other unit's MDP). Also, the SPAR model includes a MDP CCF event covering both unit MDPs, so changes in the independent failure rate of the MDPs would manifest themselves in changes to the common-cause failure rate as well as discussed in NUREG-1816, and thus additional change to the CDF in the linear approximation of the MSPI formulation. Therefore, it seems most appropriate to leave the entry of 1.25 (for 2 MDPs) as is, rather than changing it to 1. This also applies to Point Beach 1/2.

Table 3. Generic CCF Adjustment Values

	EPS	HPI		HRS/		RHR
	EDG	MDP Running or Alternating <sup>+</sup>	MDP Standby	MDP Standby	TDP **	MDP Standby
Arkansas 1	1.25	2	1	1	1	1.5
Arkansas 2	1.25	1	2	1	1	1.5
Beaver Valley 1	1.25	2	1	1.25	1	1.5
Beaver Valley 2	1.25	2	1	1.25	1	1.5
Braidwood 1 & 2	3	1.25	1.25	1	1	1.5
Browns Ferry 2	1.25	1	1	1	1	3
Browns Ferry 3	1.25	1	1	1	1	3
Brunswick 1 & 2	1.25	1	1	1	1	3
Byron 1 & 2	3	1.25	1.25	1	1	1.5
Callaway	1.25	1.25	1.25	1.25	1	1.5
Calvert Cliffs 1 & 2	1.25	1	2	1.25	1.5	1.5
Catawba 1 & 2	1.25	1.25	1.25	1.25	1	1.5
Clinton 1	1.25	1	1	1	1	1.5
Columbia Nuclear	1.25	1	1	1	1	1.5
Comanche Peak 1 & 2	1.25	1.25	1.25	1.25	1	1.5
Cook 1 & 2	1.25	1.25	1.25	1.25	1	1.5
Cooper Station	1.25	1	1	1	1	3
Crystal River 3	1.25	2	1	1	1	1.5
Davis-Besse	1.25	1.25	1.25	1	1.5	1.5
Diablo Canyon 1 & 2	2	1.25	1.25	1.25	1	1.5
Dresden 2 & 3	1.25	3	1	1	1	3
Duane Arnold	1.25	1	1	1	1	3
Farley 1 & 2	2	2	1	1.25	1	1.5
Fermi 2	1.25	1	1	1	1	3
Fitzpatrick	3	1	1	1	1	3
Fort Calhoun	1.25	1	2	1	1	1.5
Ginna	1.25	1	2	1.25	1	1.5
Grand Gulf	1.25	1	1	1	1	1.5
Harris	1.25	2	1	1.25	1	1.5
Hatch 1 & 2	2	1	1	1	1	3
Hope Creek	1.25	1	1	1	1	1.5
Indian Point 2	1.25	1	2	1.25	1	1.5
Indian Point 3	1.25	1	2	1.25	1	1.5
Kewaunee	1.25	1	1.25	1.25	1	1.5
LaSalle 1 & 2	1.25	1	1	1	1	1.5
Limerick 1 & 2	3	1	1	1	1	3
McGuire 1 & 2	1.25	1.25	1.25	1.25	1	1.5
Millstone 2	1.25	1	2	1.25	1	1.5
Millstone 3	1.25	2	1.25	1.25	1	1.5
Monticello	1.25	1	1	1	1	3
Nine Mile Point 1	1.25	3	1	1	1	3
Nine Mile Point 2	1.25	1	1	1	1	1.5

Deleted: 1.25

Deleted: 1.5

	EPS	HPI		HRS/		RHR
	EDG	MDP Running or Alternating <sup>+</sup>	MDP Standby	MDP Standby	TDP **	MDP Standby
North Anna 1 & 2	1.25	2	1	1.25	1	1.5
Oconee 1, 2 & 3	3 *	2	1	1.25	1	1.5
Oyster Creek	1.25	1	3	1	1	3
Palisades	1.25	1	1.25	1.25	1	1.5
Palo Verde 1, 2 & 3	1.25	1	1.25	1.25	1	1.5
Peach Bottom 2 & 3	1.25	1	1	1	1	3
Perry	1.25	1	1	1	1	1.5
Pilgrim	1.25	1	1	1	1	3
Point Beach 1 & 2	1.25	1	1.25	1.25	1	1.5
Prairie Island 1 & 2	1.25	1	1.25	1	1	1.5
Quad Cities 1 & 2	1.25	1	1	1	1	3
River Bend	1.25	1	1	1	1	1.5
Robinson 2	1.25	1	1.25	1.25	1	1.5
Salem 1 & 2	1.25	1.25	1.25	1.25	1	1.5
San Onofre 2 & 3	1.25	1	2	1.25	1	1.5
Seabrook	1.25	1.25	1.25	1	1	1.5
Sequoyah 1 & 2	1.25	1.25	1.25	1.25	1	1.5
South Texas 1 & 2	2	1	2	2	1	1.5
St. Lucie 1	1.25	1	1.25	1.25	1	1.5
St. Lucie 2	1.25	1	1.25	1.25	1	1.5
Summer	1.25	2	1	1.25	1	1.5
Surry 1 & 2	1.25	2	1	1.25	1	1.5
Susquehanna 1 & 2	3	1	1	1	1	3
Three Mile Island 1	1.25	2	1	1.25	1	1.5
Turkey Point 3 & 4	1.25	1	3	1	3	1.5
Vermont Yankee	1.25	1	1	1	1	3
Vogtle 1 & 2	1.25	1.25	1.25	1.25	1	1.5
Waterford 3	1.25	1	2	1.25	1	1.5
Watts Bar 1	1.25	1.25	1.25	1.25	1	1.5
Wolf Creek	1.25	1.25	1.25	1.25	1	1.5

Deleted: 1.5

Deleted: 2

Deleted: 2

Deleted: 1.25

\* hydroelectric units      \*\* as applicable

<sup>+</sup> Alternating pumps are redundant pumps where one pump is normally running, that are operationally rotated on a periodic basis.

	SWS			CCW		All	All
	MDP Running or Alternating	MDP Standby	DDP **	MDP Running or Alternating	MDP Standby	MOVs and Breakers	AOVs, SOVs, HOVs
All Plants	3	1.5	1.25	1.5	2	2	1.5

\*\* as applicable