Review Comments on NRC Staff Comments on FAQ 07-0035, Revision 0 [RHG] {12/20/2007}

No.	Location in Document	Comment
1	Page 1, Title	This FAQ as written would apply to any bus duct regardless of voltage. Some plants have 208/120 VAC bus ducts in their maintenance shop. The FAQ should be limited to only those bus ducts operating at 1,000 volts or higher AND are otherwise not provided with prompt acting devices that would interrupt the flow of current given a fault condition - i.e., differential relays. If they are, then we should take credit for them - their random failure is required in order for the HEAF event to occur given the current prescribed treatment. If the treatment is changed as discussed in other comments, then nearby target damage (not ignition) may be a reasonable thing to do.
2	Page 1, Background	We had discussed in a phone conference before the FAQ was prepared that the treatment of a case where a plant had a PM program that consisted of a condition based maintenance program. Such a program, for example, might include a diagnostic task relying on thermography for directing PM. The implementation/crediting of such a program should be used as the basis to preclude the occurrence of the event described in this FAQ. This 'credit' is not discussed in the FAQ.
3	Page 3, Last Paragraph, 2nd Sentence	We've checked at least four plants now and have yet to find one where this is possible to determine connections simply by exterior inspection alone. In all cases, one must refer to design drawings. The alternative would be to agree to some nominal length that can be assumed without further justification or documentation. It is proposed that the FAQ offer an alternative based on an assumed 10 foot length of bus duct. The counting would be based on the assumption that 10 foot lengths of bus ducts are connected to each transition point. As this approach is applied from each transition point it is expected that instances will occur where the location of a connection relative to a Physical Analysis Unit (PAU) boundary is indeterminate. This would be because the 'counting would place the connection on one side of the boundary when starting from one transition and the opposite side when starting at another. In such cases, it is proposed that a count of 0.50 to applied to each side.

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4	Page 4, 1st Full Paragraph	Just to confirm, the treatment considers the three individual bus ducts collectively and counts them a '1'. Also, the counting of '1' applies to the entire assembly - from the main generator lugs to the main transformer including the taps to the auxiliary transformer(s) and PT compartment. For the iso-phase bus duct, it is assumed that the disconnect link (or MOD if present) would count as a single connection regardless of the actual number of bolted connections. The following examples are intended to provide further clarification of this comment. a. Case 1 – bus duct connecting the main generator lugs and three single phase transformers or a single three phase transformer. No unit auxiliary transformer is connected to the iso-phase bus duct. However, the typical potential transformer and neutral compartment exists. In this case, it is assumed that the weighting would simply count '1' at each end. b. Case 2 – same as above, but two three phase main transformers are used. In this case, it is assumed that the total count would be '3'. c. Case 3 – same as case 1, but now an auxiliary transformer is connected to the iso-phase bus duct. In this case, the total could be '3'.
5	Page 4, Table 1, FEDB Incident Number 195 Description	Supplemental information or data required. This description combined with the lack of data in the FEDB does not support counting this item as a bus duct HEAF.
6	Page 4, Table 1, FEDB Incident Number 575 Description	Same as comment #5 above. It would seem that this event is really just a transformer fire.

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7	Page 4, Table 1, FEDB Incident Number 678 Description	Here's the full description from the FEDB A section of the bus bar running from the mat to the bus switchgear was badly damaged due to installation failure and a subsequent fault. The fault on the bus bar caused an undervoltage condition of less than 77 percent voltage on buses 1-1 and 1-2. The differential current protection functioned as designed and opened all breakers on the affected protection zone. This de-energized the affected bus and terminated the fire. During normal operations, a combination of insulation failure, debris accumulation, and possibly water resulted in an electrical fault in a main (4000 AMP) power bed bus bar. Degradation of the electric power feed resulted in a reactor trip. The fault was detected by a phase inbalance (differential current) alarm in the main control room and by reports of smoke in the turbine building basement. The fire brigade was called out. Deenergizing of the bus ended the fire. In addition to damage to the effected bus, "several non-safety related cables located in a cable tray adjacent to the bus experienced insulation failure". The required treatment for a HEAF is targets are instantly ignited. In this event, a nearby cable was damaged, but not ignited. This would seem to suggest that this event should be considered a 'really' bad fire - not a HEAF event.
8	Page 4, Table 1, FEDB Incident Number 994 Description	Fault on bus bar caused the xfmr to 'explode' causing smoke and flames. Put out after 2 min. Seems like this one is simply a transformer fire (failure) - not a bus duct HEAF.
9	Page 4, Table 1, FEDB Incident Number 2426 Description	This one has no description in the FEBD - but it was noted that damage was limited to origin which seems to conflict with the description here. Also, the description talks about 'jumping' which seems to be inconsistent with the recommended treatment where the slag is assumed to only fall down.
10	Page 4, Table 1, FEDB Incident Number 732 Description	Description from the FEBD The non-class 1E13.8 KV bus 1E-NAN-S02 faulted to ground exacerbating an existing fault in the unit transformer causing the Unit Auxiliary Transformer to rupture and catch fire. This caused a loss of electrical power to the reactor coolant pumps. An attempt was made to reenergize the faulted bus 1E-NAN-S02 and a fire started in the switchgear. Bus 1E-NAN-S01 was reenergized at 17:49. Multiple deluge system actuation. This event seems to involve a simple electrical cabinet fire combined with a transformer fire. It is unclear whether a bus duct HEAF was actually involved.

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11	Page 5, Table 1, FEDB Incident Number 792 Description	This event is 'interesting' in that the failure was not the bus duct, but was instead the 'bonding' conductors on the outer cover of the bus duct. There's no discussion of arcing, fire beyond the bonding conductors themselves, and no hydrogen involvement. Again - I do not believe that hydrogen cooling for the iso-phase bus duct is actually used or if it is, it's the exception rather than the rule.
12	Page 5, Table 1, FEDB Incident Number 962 Description	Full Event Description from the FEDB Event occurred on November 24, 1992 at approximately 14:18 hours in the Auxiliary Building. The plant was operation at full power. The fire was reported to be approximately 2 minutes in length. The ground fault occurred between the main generator and the main unit transformers when an upper inspection window on the "A" phase bus duct came loose and fell inside. The gasket around the glass window contacted the high voltage bus disconnect link assembly inside the duct causing a phase-to-ground short circuit. The gasket ignited, resulting in a small contained fire which self-extinguished in less than fire minutes. An investigation concluded that during the recent maintenance activity, someone left the scaffolding for an indeterminate reason and stepped on the ductwork, including directly on "A" phase glass. It appears that the glass was then cracked and loosened in its gasket. The Fire Brigade and Fire Protection personnel arrived on the scene shortly thereafter. No fire fighting agents were required. Why is this event included - the description says it self-extinguished and there was not damage other than the initiating bus duct itself.
13	Page 7, 4th bullet	The required treatment is that the 'target' is ignited when the events that are counted do not include this consequence. This seems like an unnecessary introduction of conservatism. It is recommended that 'downward' targets within the 30 degree ZOI be considered ignition possibilities while all other targets within the 1.5 ft radius be considered only damage consequences - not ignition - unless someone wants to develop a treatment to determine the transition radial distances - damage to ignition.
14	Page 7, 5th bullet	Needs to be clarified. As written, it conflicts with the next bullet.
15	Page 7, 6th bullet	As written, an electrical cabinet or switchgear that does not meet the requirements of being sealed must be assumed to be disabled by a bus duct HEAF if any portion of the switchgear with within the ZOI. The guidance should be based on whether the unsealed penetration is within the ZOI.
16	Page 7, 7th bullet	If I have a cabinet with one unsealed penetration, the molten material will melt the steel top. If I seal that penetration, the molten material doesn't melt the steel top. This doesn't seem to make sense.

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17	Page 7, 12th bullet	Footnote 2 is a reference to a DCPP event on the prior page - is this correct? Was the footnote reference intended to be 3 – in addition, should the footnote be expanded to address 'typical' gauges of steel tray covers or will be user be required to justify the thickness in the context of typical electrical cabinet construction?
18	Page 8, 1st bullet	This seems overly restrictive. It would seem that if an aluminum cover of sufficient thickness is used, it would be functionally equivalent to a sheet metal steel cover that is generically 'blessed' as adequate regardless of thickness. Seems like a qualifier should be added to allow supplemental analyses. And that the analysis does not need to explicitly treat a pool of molten metal, but to instead be a parametric treatment of a certain minimum thickness of steel to determine an equivalent thickness of alum to provide an equal thermal capacity/performance.
19	Page 9, 1st paragraph, 3rd sentence	I think an informal survey is needed here. I do not believe that hydrogen cooling of the iso-phase bus duct is common and the use of the term 'generally' in footnote 4 is misleading. All of the iso-phase bus ducts that I've had experience with are NOT cooled using hydrogen. Consider the difficulty of maintaining a seal on the bus duct enclosure and well as the taps to the PT/neutral compartment. If the suggested treatment is intended to consider the implication of hydrogen, then that should be more clearly described and a treatment be provided if hydrogen is not used.