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Subject: Comments on Draft Regulatory Guide DG-1153, Availability of Electric Power Sources

Dear Sir or Madam:

The following comments on draft regulatory guide DG-1153 are submitted by the IEEE Nuclear Power Engineering Committee (NPEC). These comments were collected from the membership of NPEC Subcommittee 4 that has the responsibility for IEEE standards relating to Auxiliary Power Systems of Nuclear Power Generating Stations. Because of the limited time available for response, these comments have not been balloted by NPEC and, therefore, do not represent a consensus position of NPEC.

- 1) DG 1153 identifies shutdown time periods which in many cases are shorter than our existing TS LCO operating periods.
- 2) Section B, subsections (2) and (3) appear to acknowledge that shutting down the unit with a degraded off-site source is not necessarily the most prudent action.
- 3) Section B, subsection (1)(b) should be clarified. Is the intent to emphasize the need to ensure that the loss or failure of the off-site source won't result in the loss of an on-site source?
- 4) The issue relating to which grid contingencies need to be considered [Section B, subsection (1)(a)] remains a point of discussion. Most units assume a unit trip and transfer of station and/or accident loads as the limiting contingency.
- 5) There could be a case where a unit normally powered from the off-site source could trip because of a degraded off-site source resulting from a trip of a critical generator or power source. In this case the capability of the off-site source would need to consider a single contingency comprised of the initiating event (trip of a generator or power source) and the unit trip. Under this scenario, would we need to also consider an accident? Does this scenario need to be considered at all?

SUNSI Review Complete

Template = ADM-013

E-RIDS = ADM-03

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- 6) The following statement in section B, item (1), is inappropriate and should be deleted: "The LCO of nuclear power plants are met when all electric power sources required by GDC 17 are available at the required voltage and capacity for the nuclear station and capable of withstanding a system contingency such as (a) a single failure involving loss of any other critical generation source, or loss of power from a transmission system element, or (b) a double failure involving a loss of power from the transmission network and the loss of one train of onsite ac power." This position is problematic for the following reasons:
- The LCO would always be exceeded, since loss of a transmission line that transmits power from the transmission network to the onsite electric distribution system, for example, would always result in loss of that particular offsite power supply.
  - It is inconsistent with the definition of LCOs in 10CFR50.36(c)(2), which are "the lowest functional capability or performance levels of equipment required for safe operation of the facility." GDC 17 defines the safety function of the electric power sources to be "...to assure that (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and, (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents." The offsite power sources are fully capable of meeting these safety functions even during periods when a postulated transmission system disturbance could cause loss of one or both offsite power supplies. This is because (1) the disturbance is only postulated and has not actually occurred, (2) 10CFR50, Appendix A, already acknowledges that a loss of offsite power event is an "anticipated operational occurrence", and (3) postulated accidents would not affect the ability of the electric power sources to perform their safety functions, since the only identified vulnerability is to a disturbance on the transmission network that is unassociated with any occurrences at the nuclear plant.
  - It reflects a de facto new requirement that the licensee certify that the transmission network be single failure proof, or in the case of a double failure, double failure proof. Although GDC 17 mentions the "transmission network," it does not impose any specific design or operating requirements on it. As such, this would be a backfit if it were to be implemented.
  - It is contrary to the staff interpretation that there is no "requirement for meeting single failure, and in the absolute sense single failure cannot be met because there is only one power source, the grid" (NUREG 0800, "NRC Staff Interpretation of the Requirements of GDC 17").
  - It involves no risk-informed rationale, such as the probability that the particular transmission network disturbance could occur.
- 7) In the section entitled "The Available Offsite AC Power Sources Are Two Less Than the LCO," the statement is incorrect that "this level generally corresponds to total loss of the immediately accessible offsite power sources." Most commonly, this level is the result of insufficient transmission system voltage support during periods when the immediately accessible offsite power sources have not been lost, but are operating within their normal voltage ranges. Due to the inadequate voltage support, an event involving tripping of the nuclear unit's main generator could cause loss of the offsite power sources due to loss of switchyard voltage support when the generator trips. This would result in actuation of the degraded voltage relays, tripping of the offsite power circuits, and transfer of the safety buses to the diesel generators.
- 8) On page 4, under Available Offsite AC Power Sources Are Two Less than the LCO, it states that "... the configuration of the redundant onsite ac power system that remains available for this degradation level is not susceptible to a single bus or switching failure ..." If both the

offsite power system circuits are dependent on the reactive power support from the nuclear generating station, the voltage may dip into the range of the degraded voltage relays after nuclear plant shutdown loads have begun to sequence on. In the same paragraph, it states "... the time required to detect and restore an unavailable offsite power source is generally much less than that required to detect and restore an unavailable onsite ac power source." The offsite source problem may not be detected and restored for several reasons. The status of the onsite source is generally well known.

- 9) Bottom of page 3: Treating loss of one offsite source as equal to both does have some precedent in requiring plants to shutdown for a hurricane. However it is not clear how this would be implemented in general. Many plants have two sources of different voltages that are not equally susceptible to general conditions. Perhaps this requirement should be removed to another document.
- 10) The guide points out that a plant may have more power sources than is necessary for the LCO. Many do, but these additional sources may not fulfill Technical Specification requirements. Generally, treatment of these "sources" is to modify the AOT based on the reduction of risk from these additional sources. The top of page two talks about plants that do not meet standard design requirements and that loss of sources for these plants is more stringent than those recommended in this guide. The basis for being more stringent is a direct result of having a different risk profile. However, I have never seen guidance or actual Technical Specification implementation of more stringent criteria for plants in this category. Many plants have EDG reliability requirements based on offsite power risk considerations. It would seem that the general construction of this guide is to manage risk to specific criteria. Based on that I would think that general criteria could be specified but that AOTs be adjusted based on actual risk for the specific design at hand. This would offer new and existing plants considerations for initial design or modifying current design to gain operational flexibility while maintaining or improving risk. It would also recognize that perhaps a next generation plant risk for loss of off-site power is quite small compared to current plants and that in itself would warrant significantly different AOT values if not different criteria! A PRA approach also would allow for design insights that may not currently be apparent to the industry or the regulator.
- 11) I disagree with the statement that this is not a change to the interpretation of GDC -17. It expands the concern and evaluation for operability from the two connections with the grid to "and is the Grid Stable?" and "is the mode of failure of the one source liable to remove the other source?" Some examples of questions to answer would be:
  - What criteria would be used to determine if an Ice Storm that caused one source of offsite power to be lost is threatening the other source?
  - When would the impact of an Ice Storm be considered past?
  - Repeat for tornado, hurricane, severe thunderstorms, and earthquake.
- 13) I do not disagree with the concern only with the position that it is not new. Some of the actions and requirements being placed on us (nuclear generation) require the grid operator to take action. In a vertically integrated monopoly this approach is fine. However, with deregulation there is no guarantee that the local transmission operator and the nuclear generator will be a part of the same company. As such this part of the requirement is best handled as a joint position of the NRC and FERC.
- 14) General - There is nothing wrong with RG 1.93 for existing plants, and new plants subject to GDC 17. This RG would only be applicable to the advanced designs from the DC perspective, which is about 4 paragraphs of the entire document. The changes that were made to this revision are basically in error as evidenced by the subsequent comments. My proposed resolution is to abandon the revision.
- 15) \*Intro, item (3) - the phrase "...to maintain core cooling, containment integrity, and other vital safety functions." was added to the onsite DC power sources. This phrase applies to offsite AC

and onsite AC also, and essentially goes without saying. Either add to the entire paragraph or delete.

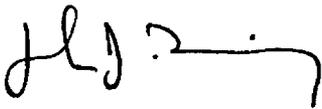
- 16) \*Discussion, item (1) - Do not use the terms single failure and double(?) failure when discussing offsite AC power systems. These terms mean very specific things in the nuclear industry, and none of those specifics relate to the offsite AC power systems. Use terms like "loss" or "unavailability" when discussing offsite AC.
- 17) Discussion, item (2) - Delete the sentence "For example, the risks..." This statement is presumptive, and may not be true. Under periods of light load, the relative value of a generator may be more significant such that its loss may result in grid issues.
- 18) \*Discussion, item (2) - Delete the phrase ... "(generation, transmission, and capacitor banks)...". The discussion here is related to a (72 hour) LCO. Issues caused by generation and capacitor banks should be able to be resolved within hours and shouldn't enter into the equation. Loss of a transmission line may be more significant if is directly connected to the offsite source. Overall, this phrase does not add value to the discussion.
- 19) \*Discussion, Offsite AC one < LCO, last phrase first para. - Delete "..., especially when the grid operator utilizes real-time contingency analysis." This phrase has no relevance.
- 20) \*Discussion, Offsite AC one < LCO, second para. - Delete paragraph. RG 1.93 combined the discussion of offsite and onsite one less than the LCO under one section. Since this document has separated them into two sections, a comparative discussion is no longer necessary.
- 21) \*Discussion, Onsite AC one < LCO, second para. - Delete sentence "Since any inadvertent..." Draft GL 2006-02, Q3(a) states: "If the TSO notifies the NPP operator that a trip of the NPP, or the loss of the most critical transmission line or the largest supply to the grid would result in switchyard voltages (immediate and/or long-term) below TS nominal trip setpoint value requirements (including NPP licensees using allowable value in its TSs) and would actuate plant degraded voltage protection, is the NPP offsite power system declared inoperable under the plant TSs? If not, why not?" Although this GL hasn't been issued, it's technically difficult to answer NO to this question, at least from a trip of the NPP. Therefore, back to the comment, if an inadvertent trip of the NPP would result in loss of offsite AC, the offsite sources would be considered inop, and you would be in a different section of this RG. Deleting this sentence does not detract from the argument.
- 22) \*Discussion, Onsite & Offsite AC each one < LCO - Delete sentence "Moreover, if the offsite..." This is design specific, and does not add to the logic.
- 23) Discussion, Onsite AC 2 < LCO, and elsewhere - The RG should be reviewed from the perspective that RG 1.81, 1/1975, prohibits the sharing of onsite electrical power systems between units for any plant with a construction permit application made after 6/1/1973. As this Draft RG will not be invoked retroactively, all new plants will have their construction permits after the applicability date of 1.81.
- 24) Discussion, Onsite DC one < LCO - Delete "(e.g., a subsequent ...)". Although this phrase may be true, single failures don't need to be assumed in response to plant transients, only design basis accidents.
- 25) Reg Position 1 - Re-phrase the first paragraph to eliminate discussion regarding total loss of offsite power as a result of tripping of the NPP. Basis is per discussion under comment 8, above.
- 26) Reg Position 4 - Delete condition (1) based upon previous discussions.
- 27) Decision Flow Diagram - It's often said that picture = 1000 words, this may be the exception. The flow diagram cannot be used by itself since one of the key decisions is "Conditions satisfied for power operation to continue?". In order to proceed beyond this block, one needs to return to the words for guidance. I don't believe that in all the years since 12/1974 that I have used the flow diagram in place of the text.
- 28) \*Backfit Analysis - From a regulatory perspective, it would probably make more sense to invoke this DG from a COL date. As stated here, all previously licensed plants would be

subject to these requirements. If it is invoked for all future plants subject to GDC 17, then there's no need to consider backfit. This way the discussion regarding "current regulatory practice" doesn't need to take place. Additionally, RG 1.93 does have a date, so how can a revision not do a backfit analysis if it eliminates the applicability date.

\* These comments are prompted by incorrect revisions to the original RG. Most of these comments are fatal flaws in the RG. In general, the comments without the \* would be considered enhancements.

Because these are draft comments and are not the consensus position of the Nuclear Power Engineering Committee, please contact Mr. Harvey Leake at 623-393-6986 or by email at [H.C.Leake@ieee.org](mailto:H.C.Leake@ieee.org) if you should have any questions.

Very truly yours,



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