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December 19, 1996

Mr. David Meyer
Chief, Rules Review and Directives Branch
Division of Freedom of Information and Publications Services,
Office of Administration,
U. S. Nuclear Regulatory Commission,
Washington, DC 20555

Subject: Comments on Draft Regulatory Guide DG-1045 (RG 1.105 Rev. 3) "Setpoints for Safety-Related Instrumentation"

Dear Mr. Meyer:

The attached comments are submitted by the Westinghouse Electric Corporation ("Westinghouse") in response to the United States Nuclear Regulatory Commission ("NRC") request for public comments on the proposed draft Regulatory Guide DG-1045, "Setpoints for Safety Related Instrumentation". The NRC request was published in the October 28, 1996 Federal Register, Volume 61, Number 209, page 55675.

Westinghouse appreciates the opportunity to provide these comments. Should you wish to discuss these in greater detail, please contact me at (412) 374-5169.

Very truly yours,

N. J. Liparulo, Manager
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WESTINGHOUSE COMMENTS ON DRAFT DG-1045

(Proposed Revision 3 to Regulatory Guide 1.105)

SETPOINTS FOR SAFETY-RELATED INSTRUMENTATION

Westinghouse has reviewed Draft Regulatory guide DG-1045, Setpoints for Safety-Related Instrumentation, and is providing the following comments.

1) The proposed revision notes in Section B (Discussion), areas in which problems have been noted, i.e., the plant procedures or setpoint process "...(2) did not always reflect current design criteria, and (3) did not ensure that revised instrument loops were verified to the original design requirements or instrument modifications were evaluated for their effect on setpoint calculations. It has also been noted that licensees do not typically verify whether setpoint calculation drift assumptions have remained valid for the system surveillance interval." However, it is not clear from reading either the proposed revision to the Regulatory Guide nor the ISA standard endorsed by the revision, that the problem areas have been adequately addressed. For example, the proposed Regulatory Guide references Generic Letter 91-04 which would require some evaluation of the above noted areas on the part of the plant if implementing a 24 month fuel cycle. But there are no requirements for evaluation outside of that implementation regime, e.g., maintenance of an 18 month fuel cycle. Thus there is no mechanism noted to capture those plants which do not make significant changes to the plant licensing basis. It appears somewhat incongruous that the noted aspects are important if changing the surveillance interval or hardware, but are not important if the current hardware or surveillance interval is not changed and yet are sufficiently important enough to warrant discussion with regards to past inadequacy. It is suggested that a more generic implementation of calculation and surveillance verification is in order.

2) On page 3 of the proposed revision there is a paragraph which discusses the "trip setpoint" and region "E" of Figure 1. In this paragraph is the sentence, "The trip setpoint value is generally represented by the upper limit identified in Figure 1 (acceptable as-left condition)." While this may be a true statement for other NSSS vendors or setpoint methodologies, it has **never** been true for a Westinghouse supplied instrumentation trip setpoint. In the Westinghouse setpoint methodology, the trip setpoint specified in the plant Technical Specifications is the same as the "nominal" trip setpoint specified in the plant calibration procedures and corresponds to the Trip Setpoint identified in Figure 1. Plant calibration procedures are expected to limit the trip setpoint as left condition in both the high and low (or conservative and non-conservative) directions. The trip setpoint is expected to be the midpoint of the as left region defined by "E" in Figure 1. A basic requirement of the Westinghouse setpoint methodology for an instrument channel whose as found condition is outside the as left calibration tolerance (**regardless of direction**) is recalibration to within the as left tolerance. This was made explicitly clear in the Technical Specifications by the addition of the words "The setpoint for a reactor trip system or interlock function is considered to be adjusted consistent with the nominal value when the 'as measured' setpoint is within the band allowed for calibration accuracy..." in the Bases for both Reactor Trip System (RTS) Instrumentation Setpoints and Engineered Safety Features Actuation System (ESFAS) Instrumentation Setpoints. This was approved by the NRC in NUREG-0717 Supplement No. 4, August, 1982, and implemented in the initial (Operating License) version of the Virgil C. Summer Technical Specifications and many Westinghouse NSSS plant OL version Technical Specifications since that time. It is therefore difficult for Westinghouse to understand the above noted NRC statement and subsequent interpretation of Figure 1 with regards to the Trip Setpoint. Based on the 14 years that this historical data has been present it is suggested that this paragraph and the subsequent interpretation of the Allowable Value should be re-evaluated.

3) On page 5 in Section B, the first paragraph discusses the potential use of a "graded" approach for calculating instrumentation uncertainties for emergency operating procedures (EOP) and to meet a Limiting Condition for Operation (LCO) in the plant Technical Specifications. Specifically the proposed Regulatory Guide states, "...the grading technique chosen by the licensee should be consistent with the standard and should consider applicable uncertainties regardless of the setpoint application..." However, the standard does not provide any significant information other than the general statement "...for setpoints that may not have the same level of stringent requirements, for example, those that are not credited in the safety analyses or that do not have limiting values, the setpoint determination methodology could be less rigorous..." Thus a careful reading of both the standard and the proposed Regulatory Guide will note that there may be functions for which the uncertainty calculations may be less rigorous but little information is supplied in either document as to the how much less rigor is permissible. The proposed Regulatory Guide does provide the information that the calculation "...should consider applicable uncertainties regardless of the setpoint application..." Interpreting this to mean that all appropriate uncertainties must be included in a calculation regardless of application is laudable. Potential errors must not be ignored under the guise of less rigor. However, the proposed Regulatory Guide provides no guidance on an acceptable degree of less rigor. Two known examples of NRC approved calculations utilize a 95 % probability / 95 % confidence level for all terms in calculations for protection functions and a 95 % probability / 75 % confidence level for the instrument calibration and drift terms only in calculations for EOP functions. This level of differentiation when based on two-sided tolerance factors is, to be blunt, not worth the time or effort it takes to look up the second value in the tables. While there is little industry agreement on what constitutes less rigor (see the November, 1996, draft of ISA-TR67.04.09, Graded Approaches to Setpoint Determination, with its multiple schemes and levels), the lack of information provided in the proposed Regulatory Guide, the limited approach proposed in I&C Branch Technical Position 12 (three levels: 95/95 for protection functions, 95/75 for EOP, 75/75 for other functions) and the even more limited NRC approved calculations leads Westinghouse to

conclude that there is no significant benefit (either analytically or operationally) to be gained from considering "graded" approaches at this time. A significant benefit to licensees and their contractors would be NRC identification of the minimum levels of probability and confidence level that are acceptable to the Staff for various protection, control and indication functions. If the minimum levels are indeed 95/95 for protection, 95/75 for EOP and 75/75 for other functions, this should be clearly stated in the proposed Regulatory Guide. If the Staff has not made a determination of minimums, it is suggested that industry discussions be held to allow such a determination. Westinghouse has proposed a three tiered system (95/95 for protection, 75/75 for EOP and 50/50 for others for all terms in the calculation) on several occasions and plant dockets, but no serious discussion with the Staff has taken place. It is suggested that the proposed Regulatory Guide needs significant strengthening in this area to be useful to either the Staff or licensees.

4) The proposed Regulatory Guide notes eleven technical concerns that the Staff has with regards to 24 month surveillance interval drift and setpoint evaluations. While these concerns are valid points for consideration, it is suggested that the only implementation mechanism in place where these are significant is Generic Letter 91-04. It is therefore suggested that unless the Staff intends to encourage or require drift or calibration data evaluation for surveillance intervals of less than 24 months, a more appropriate notation of these concerns is in a revision to Generic Letter 91-04.

5) On page 7 of the proposed Regulatory Guide a sentence is noted, "Measurement and test equipment (MTE) criteria are not specifically identified within the standard." While this is true for the standard, other parameters are also not explicitly noted in the standard that may be appropriate for consideration on a function specific or plant specific basis. By this specific notation in the proposed Regulatory Guide, is the Staff implying that M&TE must be explicitly treated? It is suggested that further clarification of this statement is appropriate.

6) Item 1 of Section C. Regulatory Position notes, "The 95/95 tolerance limit is an acceptable criterion for uncertainties." By this statement is the Staff implying that a 95/95 tolerance limit is the minimum acceptable level for a trip setpoint? If this is not the minimum acceptable level, then what probability/confidence level combination is the minimum acceptable to the Staff. It is requested that further clarification, i.e., be more explicit, be supplied on this point.

7) Item 3 of Section C. Regulatory Position notes, "The allowable value, in conjunction with the trip setpoint, will determine the limits on instrument operability and must be specified in the TS in order to meet 10 CFR 50.36." Westinghouse does not agree with this statement in two areas; a) Based on significant data evaluation of process rack drift data, Westinghouse does not agree that the Allowable Value as currently defined will determine the limits on instrument operability. b) Based on the history of 10 CFR 50.36, Westinghouse does not agree that the Allowable Value is a reasonable definition of an LSSS as it is not a parameter that can be controlled.

With respect to 10 CFR 50.36 (c)(1)(ii)(A) Limiting Safety System Settings, it has always been a Westinghouse Setpoint Methodology assumption that the LSSS is defined as the Trip Setpoint. Prior to 1975 in the custom plant Technical Specifications, the LSSS was defined as the Trip Setpoint since that was the only trip parameter listed in the instrument related specifications. To reduce the large number of Licensee Event Reports (filed as a result of trip function setpoints found in the non-conservative direction with respect to the Trip Setpoint), the Standardized Technical Specifications introduced the concept of the Allowable Value (November, 1974). The difference between the Trip Setpoint and the Allowable Value was originally defined as rack drift. No corresponding change to redefine the LSSS was made to 10 CFR 50.36 and because the Allowable Value was defined as an uncontrolled as found parameter (as opposed to a controlled as left parameter), Westinghouse maintained the interpretation of the LSSS as the Trip Setpoint. This was consistent with the limited uncertainty evaluations that had been performed up to

that time. It is generally understood that the Allowable Value performed two purposes when it was first presented; reportability and operability. A channel found to be in excess of the Allowable Value was declared inoperable and was also formally reported.

Westinghouse uncertainty calculations, first documented the acceptability of the Trip Setpoint in June, 1978. This was performed by demonstrating for each RTS and ESFAS protection function, sufficient margin between the Safety Analysis Limit and the Trip Setpoint to account for the applicable instrument and process measurement accuracy uncertainties. The difference between the Trip Setpoint and the Allowable Value was still defined as rack drift and from a Westinghouse point of view, the LSSS was still defined as the Trip Setpoint.

In 1981, a proposal was made to include additional information in the RTS and ESFAS setpoint Technical Specifications. The Trip Setpoint and Allowable Value were continued, but the difference between the two was now defined as the arithmetic sum of the rack drift, calibration accuracy, comparator setting accuracy and the rack measurement and test equipment uncertainty. This was approved by the NRC in NUREG-0717 Supplement 4 in August, 1982. Two significant changes were explicitly approved at this time; 1) the NRC approved a change to the Bases which included the concept of a calibration band about the Trip Setpoint. This allowed the as left value for the Trip Setpoint to be in the non-conservative direction by up to the calibration accuracy utilized in the uncertainty calculation. 2) The NRC approved the use of a simple equation to determine the operability of a suspect instrument channel. The equation allowed the introduction of margin into the operability determination (either from transmitter drift in the conservative direction or from an allowance in the uncertainty calculation). With the use of this equation, exceeding the Allowable Value did not automatically result in the determination that an instrument channel was inoperable. This resulted in explicit NRC approval of a deviation from the statement in the introduction of Regulatory Guide 1.105 Rev 2; "Setpoints that exceed technical specification limits are considered a malfunction of

an automatic safety system." The uncertainty calculations performed by Westinghouse still verified the acceptability of the Trip Setpoint (by evaluating the difference between the Safety Analysis Limit and the Trip Setpoint) and from a Westinghouse point of view, the LSSS was still defined as the Trip Setpoint. This had the desired effect of decreasing the number of reported inoperable channels.

In 1983, 10 CFR 50.73 (as documented in NUREG-1022) changed the reporting requirements from a single inoperable channel to loss of functionality for a trip, i.e., reportability occurs when two or more channels are inoperable for a trip function. This eliminates all but common mode failure as a reporting requirement for RTS and ESFAS protection channels. However, the Technical Specifications continued to maintain the Allowable Value as the determining factor for channel operability of the process racks. Subsequent evaluation of process rack data indicated that this is inappropriate, i.e., typical rack drift is significantly less than the value allowed by the Technical Specifications. Thus use of the Allowable Value as the threshold for atypical performance is not particularly useful.

In 1990, through the Improved Technical Specifications program, the NRC allowed the Technical Specification LSSS value to be changed from the Trip Setpoint to the Allowable Value without a corresponding change (via rulemaking) in 10 CFR 50.36. This is significant in that the Allowable Value parameter did not exist at the time 10 CFR 50.36 was promulgated (as noted previously it was not created until late 1974 in the first Standard Technical Specifications) and that the parameter is not a controlled setting but rather an evaluation criterion for an uncontrolled as found condition. This change in the definition of the LSSS was determined by Westinghouse to be inconsistent with the most basic assumption of the Westinghouse setpoint methodology, i.e., control of the as left condition. This was identified to the NRC in a meeting held in June, 1990. In response, the NRC allowed, via a footnote to Tables 3.3.1-1 and 3.3.2-1, two approaches to the proposed instrumentation specifications in the improved Technical Specifications; the

Allowable Value alone (one column), or the Trip Setpoint combined with an Allowable Value (two columns). The approach used by each plant was to be based on the plant specific instrument uncertainty calculations.

In 1991, Westinghouse presented a paper to the Instrument Society of America noting the significance of the Nominal Trip Setpoint to the Westinghouse setpoint methodology (Reference 1). The most significant point to be gathered from this document is that the setpoint methodology focuses on the as left condition of the racks or transmitter. Drift is determined from the as left condition, not the desired calibration target value. Therefore, the first indication of device performance is the ability to calibrate and the second indication is the stability (or drift magnitude). Both parameters are evaluated with the use of the as left condition.

Also in 1991 the NRC issued two generic letters which indicate; 1) some recognition of the significance of probability, confidence levels and performance monitoring programs in instrument uncertainty calculations, at least for 24 month fuel cycles (Generic Letter 91-04) and 2) some recognition that satisfaction of the Allowable Value, or even the ability to perform the specified safety function, is not all inclusive from the point of view of operability determination. Specifically "In addition to providing the specified safety function, a system is expected to perform as designed, tested and maintained. When system capability is degraded to a point where it cannot perform with reasonable assurance or reliability, the system should be judged inoperable, even if at this instantaneous point in time the system could provide the specified safety function." (Generic Letter 91-18, Section 3.3 "Specified Function(s)" of Part 9900: Technical Guidance of the NRC Inspection Manual.) However, it appears that the application of these concepts has not been widespread.

In view of: 1) the changing industry requirements on operability, 2) the non-conservative nature of the Allowable Value when large magnitude process rack drift and M&TE terms

are included for the Eagle-21 digital racks and 3) the non-conservative nature of the Allowable Value when large magnitude process rack drift, calibration and M&TE terms are included for the analog process racks; Westinghouse presented a second paper to the ISA. This paper was presented in June, 1994 (published in June, 1995) and explicitly identified Westinghouse concerns with reliance on the current definition of the Allowable Value for determination of process rack operability. The paper also provided details concerning an alternative operability determination process (Reference 2). Discussions have been held with several plants which indicate that plant specific processes for operability evaluation (more conservative than the Allowable Value) may already be in place. In most instances, the processes in place appear to approach those suggested in Reference 2.

In April/May, 1995, NRC Region 2 (Atlanta) noted significant difficulties with the proposed Technical Specifications LSSS setpoints for a plant. The proposed Technical Specifications Tables 3.3.1-1 (for RTS) and 3.3.2-1 (for ESFAS), were based on NUREG-1431 Rev. 1 and identified inequalities for both the Trip Setpoint and the Allowable Value. Plant calibration procedures and Westinghouse uncertainty calculations allowed a two-sided calibration tolerance about the Trip Setpoint. This meant an acceptable as left condition could be either high or low with respect to the Trip Setpoint, provided the as left condition was within the specified calibration tolerance. This is consistent with the approach accepted by the NRC in 1982 and approved in NUREG-0717, Supplement 4. Region 2 indicated that an as left condition greater than the trip setpoint (for a $\leq$ inequality) or an as left condition less than the trip setpoint (for a $\geq$ inequality) was unacceptable and the plant would be found in non-compliance with the proposed Technical Specifications. The Region 2 opinion was based on a literal interpretation of the proposed Technical Specifications Limiting Condition for Operation that intentionally ignored the clarification information provided in the Bases and would have resulted in a one-sided calibration tolerance. This raises the serious question of the purpose of the Bases if it is to be ignored by the NRC.

In addition to prescribing a set of overly restrictive calibration limits, the Region 2 interpretation would also result in the introduction of a calibration bias (that was not included in the uncertainty calculations) and would have increased the drift allowed prior to exceeding the Allowable Value (which also was not included in the uncertainty calculations). If this interpretation was allowed to dominate over the plant calibration procedures, the uncertainty calculations would have been rendered deficient and the criteria for determining operability of the process racks significantly confused. In response the Staff took the initiative to define the acceptable as left condition as two-sided within the calibration tolerance and thus maintained consistency with the plant procedures and the uncertainty calculations. The resolution of the literal interpretation issue resulted in the removal of the inequalities from the proposed Technical Specification Trip Setpoints. The Trip Setpoints for this plant are now defined as nominal settings. In this specific instance, the magnitude of the Allowable Value provides only a weak reportability function as it is significantly in excess of the recommended quarterly test acceptance criteria and the 12 month design drift values which are the operability criteria for the process racks. Region 2's insistence on an as left condition more conservative than the Trip Setpoint would have created more distance between the Allowable Value and the operability criteria, thus rendering the Allowable Value even less useful.

As noted previously, the most basic assumption of the Westinghouse setpoint methodology is the control of the as left condition of the instrument channel. An acceptable calibration is defined as the relationship of the as left to the desired value. The difference between the two parameters should be as small as reasonably possible, i.e., driven to zero. Acceptable drift for the analog process racks is defined as the statistically determined expected drift (95 % probability/95 % confidence level) for that specific plant. In the practical sense this results in values for drift on the order of ⅛ to ½ of the typical instrument uncertainty calculation input drift allowance when evaluated on a 95/95 two-sided basis and reflecting the complexity of the channel. No set of Technical Specifications Allowable Values currently published by the NRC for plants with analog

Foxboro, Hagan, 7100 or 7300 process racks supplied by Westinghouse satisfies this definition of operability. For the digital process racks, the expected drift is even smaller. Based on the Eagle-21 design, drift compensation should be provided by the self-check, self-calibration process therefore, drift should be effectively zero. No set of Technical Specifications Allowable Values currently published by the NRC for plants with the digital Eagle-21 process racks supplied by Westinghouse satisfies this definition of operability.

More recent Westinghouse uncertainty calculations, e.g., 24 month fuel cycle surveillance, still evaluate the acceptability of the difference between the Nominal Trip Setpoint and the Safety Analysis Limit. A calibration tolerance about the Nominal Trip Setpoint is continued and is explicitly evaluated in the uncertainty calculations. The significance of the Allowable Value has been greatly reduced, if not eliminated, based on the continued Westinghouse position that the LSSS is defined as the Nominal Trip Setpoint and the continued acceptability of that setpoint. Operability of the channel is based on an evaluation of the rack drift (both in the field and as modeled in the uncertainty calculation) and if necessary other process rack characteristics for that channel. Acceptability for continued operation is always based on this final point: **the as left condition of the channel must be within the uncertainty calculation calibration tolerance about the Nominal Trip Setpoint**. Based on the above, Westinghouse finds the statement "The allowable value, in conjunction with the trip setpoint, will determine the limits on instrument operability..." inconsistent with Generic Letter 91-18, the probabilistic aspects of Generic Letter 91-04, Westinghouse uncertainty calculation methodology and the design operability and test acceptance criteria for Westinghouse supplied process racks for control and protection functions. Westinghouse therefore recommends that this statement and its associated instrument operability concept should be re-evaluated and modified to reflect the more appropriate and conservative requirements of the two noted NRC Generic Letters, to maintain consistency with the NRC approved Westinghouse setpoint methodology and the most fundamental aspects of process rack design.

References

1) Tuley, C. R., Miller, R. B., "The Significance of the Nominal Trip Setpoint in the Westinghouse Setpoint Methodology," Instrumentation, Controls, and Automation in the Power Industry, Vol. 34, pp. 133-140, June, 1991.

2) Tuley, C. R., Williams, T. P., "The Allowable Value in the Westinghouse Setpoint Methodology - Fact or Fiction?" Instrumentation, Controls, and Automation in the Power Industry, Vol. 38, pp. 405-414, June, 1995.