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## Submitter Information

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## General Comment

DG-1141 FALLACIES re SRSS & 95/95

For four+ decades the nuclear industry has determined instrument uncertainty by (1) add up all biases (errors with known sign); (2) combine all other errors (with no evident interdependence) via Square Root of the Sum of the Squares (SRSS). This has long been found reasonable and effective in many industries because independent errors often cancel each other. SRSS is a simple, methodical, recognized, proven way to capture this effect. It gives a demonstrably good estimate of what error magnitudes can and should be expected. Nuclear plants complement this with procedures to evaluate and account for real, observed instrument performance.

It is true that SRSS can also be applied with statistical rigor to large data sets having known distributions - but that has no bearing on the use of SRSS for data that is less regular! SRSS still provides an effective, easily understood, widely accepted, and standard method of combining uncertainties that are not additive.

So it is incredible to hear that to use SRSS one must have rigorous knowledge of populations and distributions! Or that it can be used but only in ways that remove all its value e.g. over-conservatively bounding errors that can't be proven to be normal. But DG-1141 Pg. 23 Sec. C.4.c.(4) states exactly that.

The reason is the NRC intent to impose the "95/95" criterion, which requires rigorous statistics. This push gets more serious with each new rev of the various industry guidance documents. DG-1141 p25 Sec C.6 again reinforces this.

But 95/95 is a terrible idea for real-world nuclear because:

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- (1) 95/95 has only a minuscule effect on the likelihood that redundant safety trains will actuate when required.
- (2) 95/95 cannot be met by or back-fit to existing instrument loops. Thousands of these are operating in nuclear safety systems. Replacing any such 'Q' equipment for any reason is a significant cost. Replacing a whole loop would be very costly. Replacing whole structures of loops would be impossibly so.
- (3) 95/95 data and certification on new components will be hugely expensive, on top of the usual surcharges for Appendix B manufacturing. Vendors must recover the large costs of determining and backing the 95/95 numbers from a very small market.
- (4) Even where vendors can be paid now to supply such equipment, future procurement of replacement parts will be very difficult when those specialty vendors have gone. Obtaining 'Q' part replacements has been a well-known problem for decades already. Requiring 'Q + 95/95' will make this much harder.
- (5) Even if new equipment is procured and all components in a measurement loop have 95/95 certification, the environment in which they're used will not be "95/95". This includes the skill of the engineers designing the installation, the accuracy of the drawings used, the skill of the craft maintaining the instruments, the knowledge of the analysts setting surveillance intervals etc etc etc. These will all be adequate, with numerous checks and verifications, but there are no 95/95 or better statistical certifications on such factors. So the hugely expensive 95/95 math model will be immediately debased and lost!

--> Nobody even seems to realize this!

The argument is made that 95/95 is merely "recommended" for existing plants, and is a target but not required, etc. But it is increasingly presented as a necessity going forward. EPRI 3002000864 (2013) for Advanced Nuclear Technology states that 95/95 is required by RG 1.105 R3. Also, those plants attempting to take advantage of TSTF-493 must commit to 95/95.

Saddling any plant with a costly, low-value and ultimately unattainable instrumentation commitment is not in anyone's interest and does NOT serve the public.

Summary: The 95/95 criterion should not be promoted as desirable and much less as a requirement for nuclear plant instrumentation. It diverts the station staff from considering far more important factors in instrument selection, usage and setpoint development. It makes them hesitant to employ the long-successful techniques exemplified in the ISA standards (such as SRSS). It leads to on-going confusion between these standards and NRC guidance, and within these documents themselves. Because 95/95 makes sense only as a mathematical concept, people cannot see how to address it in practice. This creates concern over how to "justify" not meeting this criterion, since all the guidance in that event eventually reduces to being impractically more conservative. These justifications will all differ since there is no guidance at all on that, and there will be endless worry and debate over acceptability.

Far from assisting the industry in doing a better job, driving it towards the 95/95 criterion will impair the good work already being done, will continue to discourage and delay progress on real improvements, and cannot ultimately accomplish anything worth even a small fraction of its cost.