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CORRESPONDENCE CONTROL TICKET

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ACTION: Appropriate

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Chairman Dale E. Klein,
FYI
Tom Gurdziel

Mr. Michael J. Wallace
President, Constellation Generation Group
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Dear Mr. Michael J. Wallace:

I do not agree with some of the Part 21 explanation GE has furnished the NRC about a deficiency in the GE-designed upper support for reactor core shroud tie rods. As I am sure you realize, the two plants most vulnerable are the Pilgrim plant and your Nine Mile Point Unit I plant.

The initiating problem was a worry that the reactor core shroud welds would fail during an accident. (The core shroud is pretty much a hollow steel cylinder, made up of pieces of rolled steel plate welded together. As installed in the reactor vessel, the cylinder axis is vertical and there are both horizontal and vertical core shroud welds.) Because of certain logic (which I do not have in front of me, right now), only the horizontal (after installation) welds are considered susceptible to failure. This gives, I believe, 3 cylinders when they fail. The solution to this problem was to use tie rods to hold the 3 cylinders together, restoring the function of the original one cylinder.

I am not knowledgeable of all the forces that exist inside a reactor vessel where an accident such as a main steam line break occurs. However, consider that, at the time of this accident, the tie rods would have to carry the force resulting from almost full reactor pressure applied over the area of the steam separator head (on top of the core shroud) since the pressure adjacent to the steam line break is only about atmospheric pressure.

So, that is one consideration in choosing the number of tie rods to use. Another consideration might be the numbers of cycles of loading the tie rod (and its end connections and their supports) endures during ordinary reactor operation. I would hope this also accounts for flow induced vibration loading.

So how do you design the tie rods? (This is a job for mechanical engineers.) However, I expect that an initial choice of the number of tie rods to be used is made. Next, a suitable type of material is selected for them. Now, the actual load stresses can be compared with the allowable stresses for the material selected. The number of tie rods can now be changed if necessary and the process started again.

When they know the load the tie rods will carry, the mechanical engineers can design the end connections. This where I have a problem. It appears to me that the load to be carried was calculated too low or the allowable stress used was too high. The result, overstress of the upper tie rod support, enables intergranular stress corrosion cracking (IGSCC), IF the other necessary factors are all present. Unfortunately, for the upper tie rod support, they are.

Besides overstress, the other factors are heat, a susceptible material, and unfavorable chemistry. You really don't have control over the heat factor in an operating reactor. You may not have control over unfavorable chemistry at the location of the upper tie rod support. However, you have control over the choice of a non-susceptible material.

It appears to me that not only did the upper support design result in inappropriately high loads (stress), but also used inappropriate material as well. Therefore I consider the cause of the Part 21 problem to be inadequate design, as well as inadequate review of design. (The IGSCC is then the result of these causes.)

I am quite dismayed that, although the original Part 21 stated that additional analysis (including finite element analysis), might be done, apparently it was not. It appears that the recommendation (in the updated Part 21 to replace the upper tie rod support) is primarily based on assumptions.

I am suggesting that you consider the following action:

have somebody with successful experience designing BWR core shroud tie rod supports review the Nine Mile Point I design and the way the design was implemented. (It appears that the FitzPatrick plant organization has, or at least, did have this experience.)

if the upper tie rod support, or any other part of the entire present modification is considered insufficient, determine if the existing design can be added to, rather than removed and replaced

finally, determine if removal and replacement is necessary

I am unhappy with this Part 21 in its updated version. I am asking you to see if you are, too.

Thank you,

Tom Gurdziel