GROUP A

FOIA/PA NO: 2014-0508

RECORDS BEING RELEASED IN THEIR ENTIRETY

Trapp, James

From: Schmidt, Wayne
Sent: Tuesday, December 24, 2013 3:06 PM
To: Scott, Michael; McKinley, Raymond
Cc: Lorson, Raymond; Trapp, James
Subject: RE: FYI re: Millstone Unit 3 TDAFW - licensee is proposing asking for a one time TS amendment to extend LCO time to 7 days

Ray and I spoke of this possibility earlier, just after the last failure. To me it is a very good idea, balancing unavailability with reliability.

From: Scott, Michael
Sent: Tuesday, December 24, 2013 7:58 AM
To: Schmidt, Wayne; McKinley, Raymond
Cc: Lorson, Raymond; Trapp, James
Subject: FW: FYI re: Millstone Unit 3 TDAFW - licensee is proposing asking for a one time TS amendment to extend LCO time to 7 days

What think ye, Wayne and Ray? Net benefit?

Mike

From: McKinley, Raymond
Sent: Tuesday, December 24, 2013 7:21 AM
To: Scott, Michael; Lorson, Raymond; Trapp, James
Cc: Krohn, Paul; Schmidt, Wayne; Shaffer, Steve; DeBoer, Joseph; Keighley, Elizabeth
Subject: FW: FYI re: Millstone Unit 3 TDAFW - licensee is proposing asking for a one time TS amendment to extend LCO time to 7 days

FYI Mike. Sounds like MS may be proposing a one time TS amendment to buy some time to go into the governor valve sometime in January. No indication that they believe there is a problem, but I am sure they have heard enough questions and want to put the issue to bed.

Ray

From: Ambrosini, Josephine
Sent: Monday, December 23, 2013 2:38 PM
To: McKinley, Raymond; Haagensen, Brian
Subject: RE: FYI re: Millstone Unit 3 TDAFW - licensee is proposing asking for a one time TS amendment to extend LCO time to 7 days

I sent this to both our PM (Jim Kim) and his backup (Doug Pickett), both of whom are out of the office until after the first of the year. Licensing wasn't able to get a hold of anybody there either, so I'm even less sure they can get the change by early next month.

From: Ambrosini, Josephine
Sent: Monday, December 23, 2013 2:33 PM
To: McKinley, Raymond; Krohn, Paul; Haagensen, Brian; Krafty, James; Mangan, Kevin; Arner, Frank; Kim, James
Subject: FYI re: Millstone Unit 3 TDAFW - licensee is proposing asking for a one time TS amendment to extend LCO time to 7 days

A1,

This would allow them to get into the valve and troubleshoot in a way that is all but impossible with the 72h action statement as written.

The wrinkle is they would like to do this soon (early January). We pointed out the difficulty of processing something like this (both on their end for preparation and ours for review), which they acknowledged, and said they would be in touch with NRR.

More to follow, I'm sure.

Jo Ambrosini
USNRC Senior Resident Inspector
Millstone Generating Station
860-447-3170

Trapp, James

From: McKinley, Raymond
Sent: Tuesday, December 24, 2013 7:21 AM
To: Scott, Michael; Lorson, Raymond; Trapp, James
Cc: Krohn, Paul; Schmidt, Wayne; Shaffer, Steve; DeBoer, Joseph; Keighley, Elizabeth
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Jo Ambrosini
USNRC Senior Resident Inspector
Millstone Generating Station
860-447-3170

Trapp, James

From: Lorson, Raymond
Sent: Friday, December 20, 2013 10:25 PM
To: Haagensen, Brian; Scott, Michael; McKinley, Raymond; Krohn, Paul; Shaffer, Steve; Schmidt, Wayne; Mangan, Kevin; Ambrosini, Josephine; Krafty, James; Arner, Frank; Andrews, Elizabeth
Cc: Trapp, James
Subject: RE: UPDATE - Millstone 3 TDAFWP Issue - OD approved by FSRC

Brian - thanks for the follow-up and nice summary.

I am glad to hear that, assuming the maintenance tech's memory is correct that the as-found condition during the initial, non-prescribed, pull test satisfies the concern. The issue may raise a separate question regarding how closely they assess and control maintenance and troubleshooting activities, but for now it sounds like they addressed the intial pull test concern. For now, I suppose we wait for next week's test results and hope that we dont have a need for further calls.

Enjoy the weekend!

Ray

From: Haagensen, Brian
Sent: Friday, December 20, 2013 6:54 PM
To: Scott, Michael; McKinley, Raymond; Krohn, Paul; Shaffer, Steve; Schmidt, Wayne; Mangan, Kevin; Ambrosini, Josephine; Krafty, James; Arner, Frank; Andrews, Elizabeth
Cc: Lorson, Raymond; Trapp, James
Subject: UPDATE - Millstone 3 TDAFWP Issue - OD approved by FSRC

Millstone FSRC approved the revised OD on the TDAFW pump at 1815 this evening. They added clarifying information regarding the results of the as-found pull test on the throttle valve and added more specificity to the compensatory measures regarding the draining of condensate and monitoring of condensate build up. I will send out the final OD once it has been approved later this evening.

The pull test: The Maintenance Manager informed FSRC that the as-found pull test was conducted with the spring removed from the governor linkage assembly whereas the as-left pull test (the test that had 26 lbs as the acceptance criteria) was done with the spring attached. The spring provided additional force in the direction of the opening stroke to assist the valve and conversely provided resistance in the closing direction. The 42 lbs (with the spring detached) opening stroke required the testing device to pull the valve without the spring augmenting the stroke. The difference in pull values between the opening stroke (~42 lbs) and the closing stroke (~10 lbs) is attributable to the weight of the valve adding to the opening stroke and the lack of the spring assist.

The Maintenance Manager reported that the technician had actually conducted two additional tests that were neither directed nor documented. Before starting the procedure, he pull-tested the throttle valve with the spring attached on his own initiative prior to talking the as-found data on the opening stroke and closing stroke with the spring removed. He recalled that these additional tests had values of 22 and 24 lbs with the spring attached. Assuming result are true, this would address our concerns that the throttle valve was binding. Tony Conat (Maintenance Manager) said he was going to give the technician a medal for taking the data without being directed before he reprimanded him for "performing work without direction in an approved procedure".

If (as reported) the as-found pull test on the throttle valve was 22 and 24 lbs, then this is clearly indicative of the throttle valve not binding. The reason this data was taken is that the root cause team (evaluating the

TDAFW pump trip from last November) had requested the data. Maintenance did not know what they were going to do with this data and nobody from the root cause team was in the room to answer why they asked for the data or how they would analyze it.

The 4 hour waiting period for preconditioning: They did not address the question of the length of the waiting period for preconditioning in the OD but said they will address it next week. It does not appear that we will need an answer until they run the pump again next week, and only then if it fails.

The final OD will have some editorial changes / typo corrections made, final document reproduced, distributed and then sent to the control room for review by the shift manager / licensed operator. Assuming he does not have any additional concerns or questions, he will formally approve the OD and exit the LCO sometime before midnight.

The LCO expires at 0942 Saturday morning.

Please call me (860-460-1028) if you have any further questions or comments. Jo is heading out to New Jersey for the weekend and Jim is on leave.

Thanks for the help from the Region and enjoy your holidays. I will be in the office on Monday if there are any further issues to be addressed.

Brian

From: Scott, Michael
Sent: Friday, December 20, 2013 5:20 PM
To: McKinley, Raymond; Krohn, Paul; Shaffer, Steve; Schmidt, Wayne; Mangan, Kevin; Ambrosini, Josephine; Haagensen, Brian; Krafty, James; Arner, Frank; Andrews, Elizabeth
Cc: Lew, David; Dean, Bill; Lorson, Raymond; Trapp, James
Subject: Support for Millstone 3 TDAFWP Issue

I'd like to give a shout-out to the addressees on this note, all of whom made a significant contribution to the staff's review of the Millstone issues the last couple of days. We came to the table with the licensee with a strong set of information, concerns, and questions, thanks to you.

I look forward to hearing how the licensee addresses your concerns. In any event, I believe your questions already got them to ask questions of themselves that would not otherwise have been asked. Well done!

Mike

Trapp, James

From: Haagensen, Brian
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I look forward to hearing how the licensee addresses your concerns. In any event, I believe your questions already got them to ask questions of themselves that would not otherwise have been asked. Well done!

Mike

DeBoer, Joseph

From: Scott, Michael
Sent: Monday, February 03, 2014 4:43 PM
To: McKinley, Raymond
Subject: RE: Millstone SIT Update

Thanks Ray - good update.

Mike

From: McKinley, Raymond
Sent: Monday, February 03, 2014 4:23 PM
To: Dean, Bill; Lew, David; Scott, Michael; Benner, Eric; Lorson, Raymond; Trapp, James; Krohn, Paul; Finney, Patrick; McNamara, Nancy; Tifft, Doug; Screnci, Diane; Sheehan, Neil
Cc: Beasley, Benjamin; Kim, James; Shaffer, Steve; DeBoer, Joseph; Keighley, Elizabeth; Ambrosini, Josephine; Haagensen, Brian; Krafty, James
Subject: Millstone SIT Update

All,

Millstone SIT Status:

- All team members arrived onsite today.
- The entrance meeting was completed this afternoon.
- The NRC press release was issued.
- Pat Finney, the SIT Lead Inspector does NOT recommend elevating to an AIT, and I concur. The Special Inspection procedure requires the Lead Inspector to make this recommendation on the first day of the inspection.
- The Unit 3 TDAFP was removed from service this morning to replace a governor linkage bearing with the correct bearing. The wrong component was installed last weekend. A 72 hour LCO was entered at 7:51 AM today to perform the work. A maintenance run will be performed this evening with the final operability run tonight. The final PMT run is the normal Quarterly ST. A full flow test into the steam generator is not required. The SIT team will observe the runs.

Ray McKinley
Chief, PB5

A/2

DeBoer, Joseph

From:	Haagensen, Brian
Sent:	Wednesday, February 05, 2014 9:28 AM
To:	McKinley, Raymond; Shaffer, Steve; DeBoer, Joseph; Keighley, Elizabeth
Cc:	Krafty, James; Andrews, Elizabeth; Finney, Patrick; Arner, Frank; Chambers, Michael; Ambrosini, Josephine
Subject:	Millstone IOD for the TDAFW pump

Last night, FSRC approved an IOD that concluded that the TDAFW pump was operable. They based this determination on the following facts and conclusions:

1. The electrical overspeed trip setpoint was last measured at 4738 rpm +/- 0.5 rpm by stobetac. The peak rpm noted during the last full flow test was 4589 rpm. The loop calibration accuracy for the speed sensor is +/- 2% so this implies the actual speed could be as high as 4709.8 gpm. They concluded that as long as the actual speed was below the setpoint tolerance, they were reliable and therefore operable. There is of course a margin issue of concern.

2. The RV45 setpoint tolerance is +/- 1% according to the vendor. The +/- 3% tolerance (that they had previously stated) is the IST requirement. The SIT reviewed the setpoint loop calibration test data for the new RV45 relief valve and determined that, when tested, it was lifting reliably within the +/- 1% tolerance range. As such, the max pressure that was measured during the full flow test was 1829 psig when the flow control valve was closed in 5.5 seconds. With RV45 set at 1850 psig, the tolerance range implies the valve setpoint drift could be as low as 1832 psig. 1832 psig is (of course) very close to 1829 psig. However, they implemented a standing order directing operators to close the AFW flow control valves no quicker than 15 seconds. This comp action should prevent pressure spikes that challenge the RV45 setpoint. During recent testing on min flow, the max pressure observed was 1803 psig. This is being captured as a margin issue of concern.

As a result of this information, they concluded (based on this initial look) the TDAFW pump was operable in the IOD. Dominion directed Engineering to prepare a prompt OD within 72 hours that looks at these conclusions in more detail. The SIT is also reviewing this IOD and will review the OD when it has been prepared. At the present time, they have answered my reliability questions and are now evaluating the "adequate margin" issues.

Brian

-----Original Message-----
From: Haagensen, Brian
Sent: Wednesday, February 05, 2014 7:20 AM
To: Haagensen, Brian; McKinley, Raymond; Shaffer, Steve; DeBoer, Joseph; Keighley, Elizabeth
Cc: Krafty, James; Andrews, Elizabeth; Finney, Patrick; Arner, Frank; Chambers, Michael; Ambrosini, Josephine
Subject: RE: Millstone Conditions

Plant status:

Unit 2 is at 100% power with Green PRA risk. They will be running the TDAFW pump today for a quarterly OP test.

Unit 3 is at 100% power with Green PRA risk. They declared the TDAFW pump operable at 1810 last night. They will be running the B EDG today but it wil not be the 24 hour run - only the monthly OP test.

A/3

Leakage numbers will be provided later. Sorry - they were not answering their phones in the control room.

Jim and I will be in the office around 9:00 AM.

From: Haagensen, Brian
Sent: Wednesday, February 05, 2014 7:08 AM
To: McKinley, Raymond; Shaffer, Steve; DeBoer, Joseph; Keighley, Elizabeth
Cc: Krafty, James; Andrews, Elizabeth; Finney, Patrick; Arner, Frank; Chambers, Michael; Ambrosini, Josephine
Subject: Millstone Conditions

We have 3 inches of new snow on the ground and presently changing over to sleet. I recommend we stay with a 2 hour delay and unscheduled leave policy. Predictions are highly variable - anywhere from 3 inches to 8 inches depending on the source. I can get in with my 4 wheel drive. Jim is not able to get in with front wheel drive until they plow out his area. We can reevaluate at 9:00 AM if the roads go down hill.

Brian

From:	Arner, Frank
To:	Haagensen, Brian; McKinley, Raymond; Finney, Patrick
Cc:	Ambrosini, Josephine; Chambers, Michael; Cook, William; Shaffer, Steve; Krohn, Paul
Subject:	RE: MS3 - Items
Date:	Thursday, February 20, 2014 11:19:57 AM

I think it's important to ensure the Evals are done when they need to be. The purpose being of course they are more detailed, get a far greater review process and are challenged by senior members of the station...i.e. PORC etc. Typically the Evals we see are detailed and quite thorough because of this and the process itself.
The fact that they back down on throttling as kind of a pseudo design requirement now due to lack of margin...may very well warrant this kind of review...as you said Brian there can be many transient scenarios where this may be a licensing bases assumption and credited for not overfilling the SGs

F

From: Haagensen, Brian
Sent: Thursday, February 20, 2014 11:01 AM
To: Arner, Frank; McKinley, Raymond; Finney, Patrick
Cc: Ambrosini, Josephine; Chambers, Michael; Cook, William; Shaffer, Steve; Krohn, Paul
Subject: RE: MS3 - Items

Frank,

As far as S/G overfill goes, I agree that a 1 minute delay for a 30 minute TCOA is probably not significant. But the purpose of the 50.59 analysis (as I understand it) is really to verify that plant response to other events are not degraded by the action. I think they should take a more systematic approach to this analysis.

Do we need to make an issue out of their substitution of 50.59 screens in place of 50.59 analyses if it is unlikely to result in a finding (based on our own analysis)? They have a history of doing this in the past.

Brian

From: Arner, Frank
Sent: Thursday, February 20, 2014 10:51 AM
To: Haagensen, Brian; McKinley, Raymond; Finney, Patrick
Cc: Ambrosini, Josephine; Chambers, Michael; Cook, William; Shaffer, Steve; Krohn, Paul
Subject: RE: MS3 - Items

Brian, your assessment is dead on in all areas with respect to the potential regulatory impact of the issue. If they should have done a safety eval and did not.....but NRR approval was not required we would be in minor space from my history of dealing with these type of issues.

My gut tells me that the impact on now relying on this, may not need prior NRC approval given a few considerations outlined below

I would normally expect words of the sort, putting myself in their place, of describing why and how this is acceptable, including how it fits into their licensing bases. I would have to perform a more thorough review of the UFSAR and the screening questions in detail to reach a full conclusion.

From a real time perspective on your concern, I would expect their operators are fully cognizant of why they have to do this....the impact of closing down on these valves too quickly, like they have always been used to doing, and why they are confident that operators would remain cognizant of this for any transient response that is within their licensing bases. When I was at Limerick way way back in the old ages...I remember even having equipment tags (not clearance related) with instructions that the valves have to be throttled slowly, just as a back up to procedures and training....probably not the way business is done anymore

Safety perspective: Given that the operators would need to throttle back flow, it will mean that SG levels are normal or getting higher than where they want them to be and cooldown is going well. I would expect that if the TDAFW pump is being used, we are likely in a SBO situation or unusual MDAFW failure mode. If the worst case scenario played out and they did trip off the TDAFW on electrical OS, by backing off flow or removing SG flow, then it is likely that decay heat levels have dropped to levels where they do not need much flow to sustain function. The 15 minute delay in resetting, should not impact the SG decay heat function with respect to risk considerations.....operability compliance considerations as we all know are a bit different in that tripping of turbine isn't acceptable.

I can take on a review of this, however I will not be able to do this until first week of March as I will be on AL this PM, tomorrow and next week.

In the meantime, the considerations of how well the operators really understand this, is of the utmost importance to ensure the scenario of closing the valves too fast would not play out. As Ray knows more than any of us, operators have significant stress levels under certain scenarios and are fine tuned to the EOPs in response to issues...so this requirement needs to be somehow engrained in them so it's a no brainer while they have to deal with any potential scenarios.

Finally, the Flow control valves to the SGs fail open...this was something I had considered while onsite...if they failed closed, I would have a much higher level of concern with respect to the licensee being able to credit slowly closing these valves. In that case, it likely would not be possible and would require NRR review and approval.

In the meantime any other perspectives are welcomed.

f

From: Haagensen, Brian
Sent: Thursday, February 20, 2014 10:19 AM
To: McKinley, Raymond; Finney, Patrick
Cc: Ambrosini, Josephine; Chambers, Michael; Cook, William; Arner, Frank; Shaffer, Steve
Subject: RE: MS3 - Items

Ray, Pat,

Millstone prepared CR539463 in response to NRC questions regarding the need to perform a 50.59 evaluation (instead of screen) on the interim compensatory actions restricting the operators ability to throttle closed the TDAFW flow control valves. The CR and analysis is attached.

Millstone recently determined that a 50.59 screening was indeed the appropriate regulatory method to review and approve this operator manual action as an interim compensatory action to restore operability. I personally disagree with his analysis for the reasons stated in my previous email below (please re-read my email of 2/10 all the way at the bottom).

However, I am not an expert in the determinations of 50.59 applicability. I am requesting that someone who has the appropriate level of positional authority determine if they can use a 50.59 screen to approve the manual operator action as a compensatory measure to restore reliability and hence operability to the TDAFW pump. If the 50.59 screen is not appropriate, then they need to complete a 50.59 evaluation to credit the operator manual action – in which case, the TDAFW pump may be potentially inoperable.

My personal analysis is similar to Frank Arner's - that they could likely complete a 50.59 evaluation and the likelihood would be that the comp action does not significantly increase the risk and would not require NRC approval. But until they actually complete this evaluation, we are using our best professional judgment to fill in the blanks that the licensee should be filling in.

If the we conclude that the use of a 50.59 screen to review the risk significance of the comp action is not appropriate, the performance deficiency should be minor as long as the subsequent evaluation concludes that the increase in risk is minimal and NRC approval is not required.

There are three possible outcomes:

1. Use of the 50.59 screen was appropriate and that all is well
2. Use of the 50.59 screen was not appropriate but the subsequent 50.59 evaluation shows that NRC approval is not required
3. Use of the 50.59 screen was not appropriate and the subsequent 50.59 evaluation shows that NRC approval WAS required

I would not want to discover that outcome 3 was the appropriate regulatory treatment because they could not then credit the operator manual action and the TDAFW pump may be inoperable. I do not believe this will happen but would like someone with the requisite positional authority to weigh in on this issue.

Brian

From: Arner, Frank
Sent: Tuesday, February 11, 2014 7:33 PM
To: Haagensen, Brian
Cc: Ambrosini, Josephine; Finney, Patrick; Chambers, Michael; Cook, William
Subject: RE: MS3 - Items

Brian, I agree that based on the magnitude of change, 3-5 seconds to at least greater than 15 seconds

it is likely it would not need prior NRC approval...that said I would have to review a few more things to fully have considered the screen vice evaluation question. Most of the time when I review screens they do a fairly good job of answering similar type concerns raised by the full blown evals. There are a few events such as faulted SG at low power with mass or energy needing to be limited to containment which I havn't fully digested yet.

The advantage of doing the evals is more eyes and more thought...including PORC review etc.

Let me think more on this early next week when I get back from VY to see if there may anything else which may not have been considered besides the noted points you make.

F

From: Haagensen, Brian
Sent: Monday, February 10, 2014 11:40 AM
To: Arner, Frank
Cc: Ambrosini, Josephine; Finney, Patrick; Chambers, Michael; Cook, William
Subject: RE: MS3 - Items

Frank,

Dominion has completed and approved OD000577 revision 0 that addresses the issue of concern relating to the OS and TDAFW pump discharge pressure tolerances. Did they provide you with a copy before you left?

In the OD, they now call the standing order to operate the flow control valves slowly – an "interim compensatory measure". As required, they completed a 50.59 screen and determined that no 50.59 evaluation was required.

However, the applicable screening question is;

"Does this activity ***modify*** how SSCs are operated or ***controlled*** as described, outlined or summarized in the SAR?"

They conclude that it does not – with a caveat. They state:

"*The ability to throttle Aux Feedwater flow is discussed in the FSAR section 10.4.9.2 System Description. There is no discussions on how valves are throttled or at what rate.*"

If they now restrict or limit the rate at which one can throttle closed these valves – whereas before the rate was not addressed (and frankly was not restricted) – does this not modify the way in which the valves are controlled?

In fact, they may be restricting / delaying their ability to isolate feedwater under certain circumstances which may or may not be important. These valves have to be closed if they have a SGTR and they need to isolate flow to a faulted steam generator. There may also be other events where prompt isolation may be a requirement. Many of these events may be beyond the chapter 15 accident analysis requirements but some may not. For example, on a feed line break inside containment, the main feedwater isolation valves are required to go shut in < 5 seconds. Maintaining AFW flow through the ruptured feedwater line for 1 minute or more may be problematic (the HCV32/36 flow control valves do not close on a FWI signal). They have to be manually closed to isolate flow the faulted SG as these

valves tap in upstream (between the SG and the CTV41s / feedwater isolation valves) of the feedwater isolation valves. This manual operator action has to be completed to isolate the feedwater flow.

The AFW system description states (extracted from the Safety Functions Requirements Manual):

1. CREDITED OPERATOR ACTIONS

Section 15 of the FSAR denotes a number of tasks or actions that the operators must take within specific time frames to validate the analysis. The credited operator actions for FWA operations are:

- Initiate AFW flow to operable steam generators within 10 minutes after a steam line break or following a failure for AFW to automatically initiate.
- Isolate AFW to the affected (faulted) steam generator within 30 minutes.
- Control AFW flow to prevent overfilling the steam generators.

FSAR section 10.4.9.3 page 10.4-48 states that manual operator action is credited below 10% power operation. 3FWA*HV31A/B/C/D do not receive an auto open signal during a feedwater auto initiation signal. In this case, manual operator action is credited to open these valves and support auxiliary feedwater system operability,

I think that the 50.59 evaluation will likely show that there is no significant increase in risk and therefore will not require prior NRC approval. But it seems that they should not conclude that there is no change – hence no evaluation required - simply on the basis that the delayed operator action to throttle AFW closed was not described per se in the FSAR. They should have to conduct a complete analysis to see if the comp action created any other impacts on FSAR accident analysis events. I think it requires an analysis to reach that conclusion.

Seems an evaluation is in order. What say you?

Brian

From: Haagensen, Brian
Sent: Monday, February 10, 2014 11:08 AM
To: Arner, Frank
Subject: RE: MS3 - Items

Frank,

They last tested the mechanical OS trip on 1/26. The trip set point was established at 4860, 4880 and 4865 rpm (three trips). This test followed the linkage repair and governor replacement. They did not conduct a mechanical OS trip test last week.

Brian

From: Haagensen, Brian
Sent: Monday, February 10, 2014 9:49 AM
To: Arner, Frank
Subject: RE: MS3 - Items

Frank,

My responses to your questions / issues / statements below:

1. I will check if they tested the mechanical OS trip last week and get back to you.
2. For the HCV 32s and 36s (AFW flow control valves for TDAFW pump) – these valves are maintained in the full open position during normal operations. The discharge check valves are closed tight against RCS system pressure. Once the TDAFW pump starts, these valves remain full open and the discharge check valves swing open.
3. If the HCV36 valves are closed (by operator action - such as S/G overfill) and the TDAFW pump stops (i.e. on a pump trip), then the HCV36 valves will pressure lock closed and cannot be manually reopened. In order to reopen them, you have to first restart the TDAFW pump to repressurize the AFW discharge line. This is not a current concern but it is one of those little pieces of Millstone trivia. In the old days, the HCV36 valves would pressure lock closed when they were closed even if the TDAFW pump was running. This was of course a big problem. But they turned them around (design change) many years ago so they now pressure lock in the opposite direction (which is good).
4. The +/- 3% tolerance for RV45 is straight out of the IST code requirements (2003 - Appendix I). They are now considering changing the IST test requirements (going forward) to +1% -0% for the RV45 lift setpoint. However, I do not see how we can give them credit for the tighter tolerance band for past operability.
5. The SW discharge pressure at the headers is ~42 psig. TDAFW suction pressure is ~20 psig from the DWST. There is probably an elevation difference to consider between the SW pressure transmitters and the TDAFW pump (maybe ~10 ft?) – so we will see how this is considered / assessed in the final OD.

As always, thanks for all your help last week. It is a pleasure to work with you.

Brian

-----Original Message-----
From: Arner, Frank
Sent: Sunday, February 09, 2014 7:39 PM
To: Haagensen, Brian; Finney, Patrick; Ambrosini, Josephine
Cc: Chambers, Michael
Subject: RE: MS3 - Items

Yes, I think the question should be asked relative to why in the OD they stated the PPC got to 5318 rpm or so when it tripped, yet the mechanical OS trip was not actuated. The other trip in January I believe was 5018 rpm or so which is above the mechanical setpoint. Perhaps they were faulty readings but the station should make a statement regarding that.

I guess the accompanying question would be did they test the mechanical OS trip in all of these recent revolutions in the last week or so? I'm thinking they said they did and it was on target.

I'm not aware of anything unusual they found regarding the mechanical trip setup, but it is strange that it did not trigger based on that PPC rpm reading up to 5300 rpm on the one event.

Regarding the other issue, I believe they would normally be aligned to the DWST, so in any other test, such as min flow quarterly or the accelerated weekly tests or actual events, this offset between CST and DWST would not apply. I believe it only would apply when they do the full flow testing in Mode 3.

The last calibration data they had showed that at pressures of 1800 psig, their PPC actually indicated about 5 psig higher than what it should have by inputting a signal into the loop simulating 1800 psig. Also they believe the RV should be set to be right on the money at setpoint with respect to operability.....however with respect to design and allowable tolerance and testing, they certainly have to look at either finding more margin or reducing the tolerances.

They are in at the very least an operable but degraded with respect to design allowable tolerances condition.

One other thing to note, is that I believe on an SI signal or signal where AFW is required, the FCV's to the SGs go open. This will obviously result in discharge pressures on the order of 1300 psig or so which take away any concern with margin to the RV setpoint. Now, in the midst of event response, as they begin later to control SG levels...they may decide to back off flow all the way down to minimum flow conditions. It is at these conditions, as I recall that the importance of slowly closing the FCVs with standingnight orders comes into play to avoid the 1832 psig ranges.
One could argue that even if they did simmer or open the RV, the increase in flow..several hundred gallons per minute, would drop rpm as it would load the turbine down, and result in a discharge system pressure reduction....which should then reseat the RV given a good working RV. However, I agree that it is imperative to not get to the point where this RV would open, given the lack of margin, the challenge to the speed increase if it were to reclose...loss of several hundred gpm, and potential to increase pressure right back up to the point of re-opening it again.

It's imperative operators now follow this 15 second time requirement when dropping flows to minimum flow conditions.

Jo and Brian, I also asked about the conditions when feeding the suction with SW....which I think would be the highest pressure condition above and beyond the DWST....they were

going to review that as well.

F

-----Original Message-----
From: Haagensen, Brian
Sent: Sunday, February 09, 2014 9:57 AM
To: Finney, Patrick; Ambrosini, Josephine
Cc: Arner, Frank; Chambers, Michael
Subject: RE: MS3 - Items

Thanks for your help.

Wed will follow up with them on Monday.

They will probably want to use an RMS instrument error approach (rather than a straight sum) to address the combination of the two instrument accuracies (RV45 and instrument loop) and add the DWST/CST head difference. This will provide a result that is slightly different.

As far as the overspeed trips go, we have asked this question before and they have previously stated that the overspeed trip did not actuate. The vendor told them that the electric trip usually actuates and prevents the overspeed trip from occurring on an overspeed event. I am not sure if they can reconstruct if the electrical vs. mechanical OS trip sequence at this point but we can ask the question to get it into the inspection record.

Brian

From: Finney, Patrick
Sent: Saturday, February 08, 2014 10:49 PM
To: Haagensen, Brian; Ambrosini, Josephine
Cc: Arner, Frank; Chambers, Michael
Subject: MS3 - Items

MS3 Residents,
Two items:

1) I reviewed the OD0000577. One thing that I am not sure I agree with is the guidance going forward for discharge pressure. During the writeup they talk about the pressure instrument, the tolerance of the loop and the DWST head difference from the CST (thanks to Frank). In the summary of comp measures, they say that they should declare the system inop if discharge pressure gets to 1831.5 (1850 psig setpt of RV45 -1% tolerance). However, I think they need to declare the system inop if discharge pressure gets to 1815psig (that would be 1815 as read on the instrument + 6psig DWST head difference

and 10.5psig for the instrument loop tolerance).

2) I am not sure that we got an answer from Dominion on the three overspeed trips. Specifically, two of three appear to have reached the mechanical overspeed setting. We need them to add this to the question bank if not already done and also ask whether this was captured in their CAP. (Frank and Mike can chime in if they already got an answer on this. I think it is important that it be in their CAP and I am not aware of this being done yet.)

Pat Finney
Salem SRI
856-935-3850

DeBoer, Joseph

From: Haagensen, Brian
Sent: Friday, February 21, 2014 8:39 AM
To: McKinley, Raymond; Finney, Patrick; Cook, William; Arner, Frank; Chambers, Michael
Cc: Ambrosini, Josephine; Krafty, James; Shaffer, Steve; DeBoer, Joseph; Keighley, Elizabeth
Subject: RE: Millstone U3 TDAFP Inop Again
Attachments: Untitled

SIT Team,

Attached are 3 more CRs that address recent issues identified with the TDAFW pump. FYI

Brian

From: McKinley, Raymond
Sent: Friday, February 21, 2014 8:30 AM
To: Scott, Michael; Benner, Eric; Lorson, Raymond; Trapp, James; Krohn, Paul; Finney, Patrick; Cook, William; Arner, Frank; Chambers, Michael
Cc: Schmidt, Wayne; Cahill, Christopher; Ambrosini, Josephine; Haagensen, Brian; Krafty, James; Shaffer, Steve; DeBoer, Joseph; Keighley, Elizabeth
Subject: Millstone U3 TDAFP Inop Again

All,

Millstone entered a 7 day LCO for the U3 TDAFP on Wednesday 2/19/14 at 19:25 EDT. They detected water by UT measurement between the AOV and MOV lift check on the "A" steam line, and they administratively declared the "A" steam line inop and isolated it in accordance with their Operability Determination compensatory measures. They did not have water in the drain trap line upstream of the AOV. The "D" steam line has been isolated since December. They have now isolated the "A" line. They are required to have 2 of 3 steam lines and are now down to 1, thus the 7 day LCO for the TDAFP.

The residents are postulating that the AOV may be leaking by now given the number of start cycles with the increased test frequency. The licensee is continuing to investigate. Their path forward will most likely be to drain between the AOV and MOV and restore the "A" line. I asked the residents if the licensee planned to restore the "D" line, but the licensee has not communicated an intent to do so.

As of Friday morning, the TDAFP remains inoperable.

Joe DeBoer discussed this at the Thursday 8:00 AM meeting. I was on the call remotely, but I am not sure who was there at an SES level. I am also sending along to the SIT team for awareness.

Ray

A/5

DeBoer, Joseph

From: Haagensen, Brian
Sent: Monday, March 17, 2014 10:36 AM
To: Finney, Patrick; Arner, Frank; Cook, William; Chambers, Michael
Cc: Ambrosini, Josephine; Krafty, James; McKinley, Raymond; Shaffer, Steve; DeBoer, Joseph
Subject: TDAFW pump - the story continues...
Attachments: Scan File.pdf

Pat, Frank, Bill, Mike,

Millstone 3 will be unisolating the 'D" TDAFW steam supply line today and conducting a maintenance run on the TDAFW pump to verify operability with all three steam supply lines in service.

On 3/14, UT measurements indicated that the "D" steam line section between the MOV17D and AOV31D valves had condensate trapped in the line. The UTs indicated that the condensate level was ~2 inches below the highest UT point in the line (i.e. line is mostly full). However, the operators intend to drain the "D" steam line prior to performing the maintenance run.

UTs on the A and B steam lines have not shown any water trapped between the AOV31A/B and the MOV17A/B valves. They have been draining 0 gallons out of the standpipe and continuing to monitor and blow down the upstream steam traps.

Last week, OD000571 revision 1 determined that the condensate in the steam lines was not the cause of the previous overspeed events. CR541414 (attached) captured this incorrect technical position and assigned a level 3 ACE for evaluation of the cause(s). One wonders if they have stated that the condensate in the steam lines is not the cause of the overspeed events, why would it be necessary to continue to routinely UT these lines and drain the condensate between the AOV31/MOV17 valves prior to starting the TDAFW pump?

They are currently in negotiations (OPS is demanding - Engineering is resisting) regarding whether or not to require some form of performance monitoring criteria for the TDAFW pump starting parameters to provide a warning that the pump condition is degrading prior to failing a surveillance test. CR541439 provides additional information.

Brian

-----Original Message-----
From: R1Scan [mailto:R1Scan@nrc.gov]
Sent: Monday, March 17, 2014 9:43 AM
To: Haagensen, Brian
Subject: Scan from Millstone HP5035

Please open the attached document. This document was digitally sent to you using an HP Digital Sending device.

A/6

DeBoer, Joseph

From: McKinley, Raymond
Sent: Thursday, April 17, 2014 5:31 PM
To: Finney, Patrick; Arner, Frank; Cook, William; Chambers, Michael
Cc: Dean, Bill; Lew, David; Scott, Michael; Benner, Eric; Lorson, Raymond; Trapp, James; Krohn, Paul; Dentel, Glenn; Ambrosini, Josephine; Haagensen, Brian; Krafty, James; Shaffer, Steve; DeBoer, Joseph
Subject: Millstone TDAFP Root Cause Analysis Complete

All,

Tom Cleary from Millstone Licensing called me to inform me that the TDAFP Root Cause Analysis is complete. He will be sending it to us. Pat Finney is coordinating with his team to identify the specific week to complete the remaining portion of the Special Inspection.

Ray

A/7

DeBoer, Joseph

From: Scott, Michael
Sent: Tuesday, April 29, 2014 7:29 AM
To: McKinley, Raymond
Subject: FW: MS3 - SIT Exit - Date/Time provided

Put another way, would you or the team lead like one of us to be there? Your call.

-----Original Message-----
From: Lorson, Raymond
Sent: Monday, April 28, 2014 7:20 PM
To: McKinley, Raymond; Scott, Michael; Benner, Eric; Trapp, James
Subject: Re: MS3 - SIT Exit - Date/Time provided

Ray. I was not. I thnk sit exits are typically conducted with the tm in attendence. I would be interested in hearing key messages and findings before the exit if possible

Ray

----- Original Message -----
From: McKinley, Raymond
Sent: Monday, April 28, 2014 04:32 PM
To: Scott, Michael; Benner, Eric; Lorson, Raymond; Trapp, James
Subject: FW: MS3 - SIT Exit - Date/Time provided

All,

Were any of you planning on attending the Millstone SIT exit on May 9 at the SES level?

Ray

-----Original Message-----
From: Finney, Patrick
Sent: Monday, April 28, 2014 1:44 PM
To: Ambrosini, Josephine; Arner, Frank; Chambers, Michael; Cook, William
Cc: McKinley, Raymond
Subject: MS3 - SIT Exit - Date/Time provided

All,
SIT Exit data follows:
When: Friday, May 09, 2014 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Millstone 403

Ray,
Provided for management awareness. Please let me know if someone at the Director level or above intends to attend or dial in from a bridge. Thanks.

4/8

From:	Ambrosini, Josephine
To:	Finney, Patrick
Subject:	RE: MS3 - SIT - 2nd Week - Update
Date:	Wednesday, May 07, 2014 8:30:00 AM
Attachments:	Exit Meeting Notes for IR 201303.docx MillstoneIR1304.docx

Here are our exit notes from 2Q2013, where Brian went into great detail about his concerns with TDAFW. The earliest indications were there, during testing in the refueling outage that spring.

They took a long (IMO) time to address these concerns and were still working on an engineering evaluation for the issues when there was a plant trip in August 2013. We gave them a green FIN against the OD process in the 3Q report, as shown here. "Operation of the TDAFW pump in low flow conditions with an unstable governor challenges the lift setpoint of the discharge relief valve, 3FWA*RV45. If RV45 repeatedly lifts, the valve could fail open and allow AFW flow to bypass the SG. Excessive TDAFW pump speed oscillations challenges the overspeed trip feature of the TDAFW pump and could result in tripping the TDAFW pump when it is required to mitigate an event."

IMO, it was reasonable for them to identify the degraded issue in May 2013, when the flow oscillations illustrated there was something wrong with the system.

From: Finney, Patrick
Sent: Wednesday, May 07, 2014 8:15 AM
To: Ambrosini, Josephine
Subject: RE: MS3 - SIT - 2nd Week - Update

Jo,

Question for me is "when" did it become reasonable? Insights/thoughts are welcome.

<< Message: RE: MS3 - SIT - 2nd Week - Update >>

From: Ambrosini, Josephine
To: Finney, Patrick
Subject: MS3 - TDAFW pump summary paragraph of previous resident actions
Date: Tuesday, May 13, 2014 9:07:00 AM

Pat,

As promised, here is a short paragraph describing our response to the previous TDAFW failures. I kept it very high level and included references to the previous inspection reports, but if you want me to call out more specific detail, just let me know.

On November 4, 2013, December 18, 2013, and January 23, 2014, the TDAFW pump tripped on overspeed during surveillance testing. Details surrounding the November and December failures can be found in NRC Integrated Inspection Reports 05000423/2013005, where the inspectors documented a Green finding (FIN) for Dominion's failure to follow Procedure OP-AA-102, "Operability Determinations," and establish adequate compensatory measures to restore reliability. In addition, the inspectors previously documented another Green FIN for Dominion's failure to complete an adequate and timely operability determination to assess governor control oscillations following completion of maintenance on the TDAFW on May 17, 2013. Details for this finding can be found in NRC Integrated Inspection Reports 05000423/2013004.

Jo Ambrosini
USNRC Senior Resident Inspector
Millstone Generating Station
860-447-3170

From: Finney, Patrick
To: Haagensen, Brian; Ambrosini, Josephine
Subject: MS3 - Contacts
Date: Friday, May 30, 2014 2:08:26 PM

Can I get the titles of the following persons with missing titles?

R. Acquaro	Unit 3 Shift Manager
M. Adams	Plant Manager
L. Armstrong	
J. Barile	Nuclear Engineer III
A. Bussham	Organizational Effectiveness Manager
F. Cietek	Nuclear Engineer, PRA
T. Cleary	Licensing Engineer
D. Dodson	
G. Closius	Licensing Engineer
M. Goolsbey	Manager – Millstone 3 Operations
C. Maxson	
G. McGovern	
J. Rigatti	Manager, Nuclear Site Engineering
P. Russell	Shift Manager
S. Scace	Site Vice President
D. Scott	Senior Engineer
M. Vezina	Component Engineer
B. Willkens	Manager – Millstone Excellence

Pat Finney
Salem SRI
856-935-3850

From: Ambrosini, Josephine
To: Haagensen, Brian; Finney, Patrick; Chambers, Michael; Arner, Frank; Cook, William
Subject: RE: Millstone 3 CRs identifed by NRC SIT
Date: Monday, May 12, 2014 10:02:45 AM

I have not seen anything on the operational differences between 2 and 3 steam lines as called out in the MPR report, but I will bring it up with licensing tomorrow in our normal meeting and send along any CRs they generate.

-----Original Message-----
From: Haagensen, Brian
Sent: Monday, May 12, 2014 9:53 AM
To: Finney, Patrick; Chambers, Michael; Arner, Frank; Cook, William
Cc: Ambrosini, Josephine; McKinley, Raymond; Shaffer, Steve; DeBoer, Joseph; Andrews, Elizabeth
Subject: Millstone 3 CRs identifed by NRC SIT

Pat,

Attached are 3 CRs from last week that were generated as a result of SIT comments/questions.

Brian

-----Original Message-----
From: R1Scan [mailto:R1Scan@nrc.gov]
Sent: Monday, May 12, 2014 9:50 AM
To: Haagensen, Brian
Subject: Scan from Millstone HP5035

Please open the attached document. This document was digitally sent to you using an HP Digital Sending device.

From: Finney, Patrick
To: Haagensen, Brian
Cc: Ambrosini, Josephine
Subject: RE: Millstone 3 CRs identifed by NRC SIT
Date: Monday, May 12, 2014 10:08:56 AM

Dont like they put arner name in cr

From: Haagensen, Brian
Sent: Monday, May 12, 2014 09:52
To: Finney, Patrick; Chambers, Michael; Arner, Frank; Cook, William
Cc: Ambrosini, Josephine; McKinley, Raymond; Shaffer, Steve; DeBoer, Joseph; Andrews, Elizabeth
Subject: Millstone 3 CRs identifed by NRC SIT

Pat,

Attached are 3 CRs from last week that were generated as a result of SIT comments/questions.

Brian

-----Original Message-----
From: R1Scan [mailto:R1Scan@nrc.gov]
Sent: Monday, May 12, 2014 9:50 AM
To: Haagensen, Brian
Subject: Scan from Millstone HP5035

Please open the attached document. This document was digitally sent to you using an HP Digital Sending device.

From: Finney, Patrick
To: Arner, Frank; Chambers, Michael
Cc: McKinley, Raymond; Cook, William; Ambrosini, Josephine
Subject: MS3 - SIT Report - attached
Date: Friday, May 23, 2014 2:00:11 PM
Attachments: MillstoneIR1408.docx

Here is the latest for the report. I'd ask that the other inspectors get their input and references into the report by Tuesday mid-day so I can review. Areas that I know need work are the actual timeline, the finding, Please keep your entries in a different font or track changes. Thanks.

If the team agrees on the potential Green going away due to the CR found by Dominion, please send me an email so I can call them back and tell them.

Pat Finney
Salem SRI
856-935-3850

A/4

McLaughlin, Marjorie

From: McLaughlin, Marjorie
Sent: Thursday, May 29, 2014 3:01 PM
To: R1ENFORCEMENT RESOURCE
Subject: Millstone TDAFW Issue

Cherie and Brice,

FYI. I spoke with Bill Cook this afternoon about the MS TDAFW issue. We are scheduling the SERP for 6/17. He will send a draft of the worksheet in to us early next week to begin reviewing.

Marjey

Marjorie McLaughlin
Senior Enforcement Specialist
US NRC Region I
Phone: 610-337-5240
Fax: 610-337-5209

A/12

McLaughlin, Marjorie

From: McLaughlin, Marjorie
Sent: Thursday, August 07, 2014 6:40 AM
To: Cook, William; Finney, Patrick
Subject: MS TDAFW

Good Morning, Pat and Bill,

I just wanted to check in with you on the MS TDAFW inspection report/preliminary determination letter (PDL). Would you like me to provide you an example of a recent PDL that was issued, so you could see the language? If not, and you are already working off of one, that is fine, and I will review it when it comes around for concurrence. I also wanted to remind you that OE and NRR asked to be on concurrence for the PDL. The way that works is that I will provide it to OE electronically after you receive the RI concurrences (up to, but not including, the signatory). OE will coordinate the review with NRR.

Please feel free to contact me with any questions in the meantime. I am happy to review an early draft if you like, before you put it in concurrence, if you want a sanity check at all.

Marjey

Marjorie McLaughlin
Senior Enforcement Specialist
US NRC Region I
Phone: 610-337-5240
Fax: 610-337-5208

McLaughlin, Marjorie

From: McLaughlin, Marjorie
Sent: Monday, August 25, 2014 11:16 AM
To: Hanley, Kyle
Cc: R1ENFORCEMENT RESOURCE
Subject: RE: Request for HQ conc on Millstone PDL EA-14-092

Kyle,

We do have a request to expedite the review as much as possible, because the 45 day clock for issuing the IR will run out in 10 days. We try to not put HQ in this position, because we want to ensure you have the time needed thoroughly look over all enforcement-related documents. I apologize that we need to ask this favor. Hopefully, the fact that this is the PDL and not the final action will make it a bit more palatable!

Thank you again,
Marjey

-----Original Message-----
From: McLaughlin, Marjorie
Sent: Monday, August 25, 2014 7:47 AM
To: Hanley, Kyle
Cc: R1ENFORCEMENT RESOURCE
Subject: Request for HQ conc on Millstone PDL EA-14-092

Good Morning, Kyle,

We have obtained the regional concurrences on the preliminary determination/choice letter for the Millstone TDAFW case (EA-14-092). I am providing you the file so that you may obtain the OE concurrence and also coordinate NRR's review for concurrence.

Please provide me any comments you have and obtain from NRR, and let me know when we have the concurrences.

VR,
Marjey

McLaughlin, Marjorie

From: McLaughlin, Marjorie
Sent: Tuesday, August 26, 2014 8:46 AM
To: Finney, Patrick; Schmidt, Wayne; McKinley, Raymond; Cook, William
Cc: R1ENFORCEMENT RESOURCE
Subject: RE: Request for coordination of HQ review and concurrence of EA-14-092
Attachments: RE: Request for coordination of HQ review and concurrence of EA-14-092; RE: Request for HQ conc on Millstone PDL EA-14-092

OK, that's what Brice had thought.

I also saw Bill's recommended edit to remove a lot of that section. Let me know if that is what you guys intend to do. In the meantime, I'll provide this explanation to NRR.

Lauren did tell me that we have her concurrence, so you can enter the following on the concurrence grid:

For OE, use Kyle Hanley with a concurrence date of 8/25
For NRR, use Lauren Casey with a concurrence date of 8/26.

I attached the applicable emails from each person, if you want your admin to include them with the concurrence package.

You now have all the HQ concurrences, and can get the package ready for signature.

Marjey

From: Finney, Patrick
Sent: Tuesday, August 26, 2014 8:06 AM
To: McLaughlin, Marjorie; Schmidt, Wayne; McKinley, Raymond
Cc: R1ENFORCEMENT RESOURCE
Subject: RE: Request for coordination of HQ review and concurrence of EA-14-092

Regarding the difference in #s and before anyone takes too many actions…

I believe this is something that Wayne gave me feedback on last Friday.

Note that the paragraph is the preliminary risk assessment. This is what we used to help determine whether to launch an SIT. In fact, the conclusion of that section was that we met the criteria for an SIT. I had put this in there to show how the SIT conditions were met and it also offers a comparison of where we thought we were in significance as compared to where we ended up. I am not particularly tied to this section. I think Wayne recommended getting rid of it.

Please let me know if that answers that question.

Pat Finney
Salem SRI
856-935-3850

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
2100 RENAISSANCE BLVD., SUITE 100
KING OF PRUSSIA, PA 19406-2713

EA-14-092

Mr. David Heacock
President and Chief Nuclear Officer
Dominion Resources
Millstone Power Station
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: MILLSTONE POWER STATION – NRC SPECIAL INSPECTION REPORT 05000423/2014008 WITH PRELIMINARY WHITE FINDING

Dear Mr. Heacock:

On July 21, 2014, the U.S. Nuclear Regulatory Commission (NRC) completed a special inspection at your Millstone Power Station, Unit 3, in response to repeat overspeed trips of the associated unit's turbine-driven auxiliary feedwater (TDAFW) pump. The enclosed report documents the results of the inspection, which were discussed on May 9, 2014, and July 21, 2014, with Mr. Stephen E. Scace, Site Vice President, and other members of your staff.

The special inspection was conducted in response to the TDAFW pump overspeed trips on November 4, 2013, December 18, 2013, and January 23, 2014. The NRC's initial evaluation of this condition satisfied the criteria in NRC Inspection Manual Chapter 0309, "Reactive Inspection Decision Basis for Reactors," for conducting a special inspection. The basis for initiating this special inspection is further discussed in the inspection team's charter that is included in the enclosed report as Attachment B.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel. In particular, the team reviewed event evaluations, causal evaluations, relevant performance history, and extent-of-condition to assess the significance and potential consequences of issues related to the overspeed trips.

The enclosed inspection report discusses a finding that has preliminarily been determined to be a White finding with low to moderate safety significance that may require additional inspections, regulatory actions, and oversight. As described in Section 2.5 of the enclosed report, the finding is associated with an apparent violation of Title 10 of the *Code of Federal Regulations* (10 CFR) 50, Appendix B, Criterion XVI, "Corrective Action," for Dominion's failure to assure that a condition adverse to quality was promptly identified and corrected. Specifically, the Unit 3 TDAFW pump was operated from May 2013 through February 2014 in an adverse configuration due to the installation of an incorrect cam follower bearing. During this period, as a consequence of this adverse configuration, the pump experienced three overspeed trips.

This finding, which the inspectors determined no longer presents an immediate safety concern since the bearing was replaced on February 3, 2014, was assessed based on the best available information, using the NRC's Significance Determination Process (SDP). The basis for the NRC's preliminary significance determination is described in the enclosed report. Because the finding is also an apparent violation of NRC requirements, it is being considered for escalated enforcement action in accordance with the NRC Enforcement Policy, which appears on the NRC's Web site at http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html.

The NRC will inform you in writing when the final significance has been determined. We intend to complete and issue our final safety significance determination within 90 days from the date of this letter. The NRC's SDP is designed to encourage an open dialogue between your staff and the NRC; however, the dialogue should not affect the timeliness of our final determination.

We believe that we have sufficient information to make a final significance determination. However, before we make a final decision, we are providing you an opportunity to provide your perspective on this matter, including the significance, causes, and corrective actions, as well as any other information that you believe the NRC should take into consideration. Accordingly, you may notify us of your decision within 10 days to: (1) request a regulatory conference to meet with the NRC and provide your views in person; (2) submit your position on the finding in writing; or, (3) accept the finding as characterized in the enclosed inspection report.

If you choose to request a regulatory conference, the meeting should be held in the NRC Region I office within 30 days of the date of this letter, and will be open for public observation. The NRC will issue a public meeting notice and a press release to announce the date and time of the conference. We encourage you to submit supporting documentation at least 1 week prior to the conference in an effort to make the conference more efficient and effective. If you choose to provide a written response, it should be sent to the NRC within 30 days of the date of this letter. You should clearly mark the response as a "Response to Preliminary White Finding in Inspection Report No. 05000423/2014008; EA-14-092," and send it to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Regional Administrator, Region I, and a copy to the NRC Senior Resident Inspector at Millstone Power Station.

You may also elect to accept the finding as characterized in this letter and the inspection report, in which case the NRC will proceed with its regulatory decision. However, if you choose not to request a regulatory conference or to submit a written response, you will not be allowed to appeal the NRC's final significance determination.

Please contact Raymond McKinley at 610-337-5150 within 10 days from the issue date of this letter to notify the NRC of your intentions. If we have not heard from you within 10 days, we will continue with our significance determination and enforcement decision. Because the NRC has not made a final determination in this matter, no notice of violation is being issued for this inspection finding at this time. In addition, please be advised that the number and characterization of the apparent violation may change based on further NRC review.

In addition, the enclosed inspection report documents a violation of NRC requirements which was of very low safety significance (Green). However, because of the very low safety significance and because it is entered into your corrective action program, the NRC is treating this finding as a non-cited violation, consistent with Section 2.3.2.a of the NRC Enforcement

Policy. If you contest the non-cited violation in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator, Region I; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at Millstone Power Station. In addition, if you disagree with the cross-cutting aspect assigned to any finding, or a finding not associated with a regulatory requirement in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region I, and the NRC Resident Inspector at Millstone Power Station.

In accordance with 10 CFR 2.390 of the NRCs "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of the NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC website at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

Ho K. Nieh
Director
Division of Reactor Projects

Docket No. 50-423
License No. NPF-49

Enclosure: Inspection Report 05000423/2014008
w/Attachment A: Supplementary Information
Attachment B: Special Inspection Charter
Attachment C: TDAFW Timeline
Attachment D: Detailed Risk Significance Evaluation

cc w/encl: Distribution via ListServ

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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket No.	50-423
License No.	NPF-49
Report No.	05000423/2014008
Licensee:	Dominion Nuclear Connecticut, Inc. (Dominion)
Facility:	Millstone Power Station, Unit 3
Location:	P.O. Box 128 Waterford, CT 06385
Dates:	February 3 – 7, 2014 and May 6 – 9, 2014
Inspectors:	P. Finney, Senior Resident Inspector, Salem Generating Station F. Arner, Senior Reactor Inspector M. Chambers, Physical Security Inspector, Region IV W. Cook, Senior Reactor Analyst
Approved By:	Ho K. Nieh Director Division of Reactor Projects

SUMMARY

IR 05000423/2014008; 02/03/2014 – 02/07/2014 and 05/06/2014 – 05/09/2014; Millstone Power Station (Millstone) Unit 3; Special Inspection Team Report, Inspection Procedure 93812.

This report covered two onsite inspection visits by a special inspection team consisting of a senior reactor analyst, one senior resident inspector, and one senior reactor inspector, all from Region I, and a reactor inspector from Region IV. One apparent violation with potential White safety significance and one Green non-cited violation (NCV) were identified. The significance of most findings is indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process (SDP)," dated June 2, 2011. Cross-cutting aspects are determined using IMC 0310, "Aspects Within the Cross-Cutting Areas," dated December 19, 2013. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy, dated July 9, 2013. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 5.

Cornerstone: Mitigating Systems

- Preliminary White. The inspection team identified a self-revealing apparent violation of Title 10 of the *Code of Federal Regulations* (10 CFR) 50, Appendix B, Criterion XVI, "Corrective Action," involving Dominion's failure to promptly identify and correct a condition adverse to quality. Specifically, the Unit 3 turbine-driven auxiliary feedwater (TDAFW) pump was operated from May 2013 through February 2014 in an adverse configuration due to the installation of an incorrect cam follower bearing. As a result of this adverse configuration, the pump experienced three overspeed trips during the subject timeframe. As a consequence, Dominion violated Technical Specification (TS) 3.7.1.2, since TDAFW was determined to be either failed or unreliable for greater than the TS allowed outage time. Dominion installed the correct cam follower, entered this issue in their corrective action program (CAP) as condition report (CR) 538743 and CR 531536, and completed a root cause evaluation (RCE) (RCE 001111).

  The issue was determined to be more than minor since it was associated with the equipment performance attribute of the Mitigating Systems cornerstone and adversely affected its objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, operation of the TDAFW pump with the incorrect spherical bearing reduced the reliability of a risk-significant, safety-related mitigating system. The issue was evaluated in accordance with IMC 0609, Appendix A, Exhibit 2, and was determined to require a detailed risk evaluation based on the finding representing an actual loss of function of a single train for greater than its TS allowed outage time. The detailed risk evaluation concluded that the increase in core damage frequency of this issue is in the mid to high E-6 range, or White (low to moderate overall safety significance). The dominant core damage sequences involved fire scenarios resulting in control room abandonment that rely upon the TDAFW pump as the primary source of make-up to the steam generators and decay heat removal. This finding had a cross-cutting aspect in Human Performance, Consistent Process, where individuals use a consistent, systematic approach to make decisions and risk insights are incorporated as appropriate. Specifically, Dominion did not implement consistent, systematic approaches to resolve the condition as evidenced by their inadequate and inconsistent use of CAP and troubleshooting. [H.13] (Section 2.5)

- Green. The inspectors identified a self-revealing Green NCV of TS 6.8.1, "Procedures and Programs," when Dominion did not maintain an adequate maintenance procedure to ensure reliable performance of the TDAFW system. Specifically, TDAFW properly started following the August 9, 2013, reactor trip, but was subsequently shut down after observed flow and pressure oscillations. Dominion staff discovered the control valve linkage misaligned due to a loose cam follower bearing retaining nut. As part of the repair, Dominion implemented a revision to the C MP 711 procedure to require application of thread-locker to the cam follower bearing retaining nut during reassembly. Additionally, Dominion entered this issue in their CAP as CR 522896.

  The finding was more than minor because it is associated with the procedure quality attribute of the Mitigating Systems cornerstone and adversely affected its objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the maintenance procedure did not provide sufficient written instructions to ensure adequate torque of the retaining nut and thereby reliable performance of the TDAFW system three months after reassembly. The finding was evaluated using IMC 0609, Attachment 4 and Appendix A, Exhibit 2.A, and determined to be of very low safety significance (Green) since it was not associated with a design or qualification deficiency, not a loss of system/function, and not an actual loss of its TS function. This finding had a cross-cutting aspect in the area of Human Performance, Documentation, in that licensee organizations are expected to create and maintain complete, accurate, and up-to-date documentation. Specifically, Dominion did not maintain a comprehensive, high-quality maintenance procedure that was thorough to assure assembly of critical TDAFW components. [H.7] (Section 2.3)

REPORT DETAILS

1. INTRODUCTION

1.1 Background and Event Description

On May 15, 2013, at the end of a refueling outage, Dominion observed that the Millstone Unit 3 TDAFW pump was experiencing speed oscillations of approximately ± 100 rpm (or approximately ±5 percent of average speed) when operating in low flow conditions following a full-flow surveillance test. The pump speed oscillated within 2.8 percent of the overspeed trip setpoint at 4746 rpm. The speed oscillations caused swings in the discharge pressure of ±105 psig (approximately ±10 percent of average discharge pressure) which approached within 1.1 percent of the discharge relief valve setpoint. These oscillations were both within the 3 percent setpoint tolerances for the respective devices. After troubleshooting and several adjustments to the turbine speed control governor, the pump did not achieve the required differential pressure during a second full flow test on May 17. Dominion subsequently determined that the oscillations did not reduce pump reliability and attributed the full-flow low differential pressure to the instability of the governor. Dominion concluded that TDAFW pump differential pressure remained above the design requirements specified in the accident analysis and determined the pump was operable.

A reactor trip occurred at Unit 3 on August 9, 2013. The TDAFW pump automatically started and successfully injected to the steam generators. When full flow was no longer needed, operators reduced TDAFW flow to minimum. At minimum flow conditions, discharge pressure exceeded the discharge relief valve lift setpoint (1850 psig) and fluctuated between 1869 psig and 1609 psig. In addition, speed fluctuated between 4656 rpm and 4350 rpm with the design of the overspeed trip setpoint set at 4746 ±142 rpm. Dominion engineering requested that the pump be shut down when it was no longer required (after approximately four hours of operation) to facilitate troubleshooting. Dominion operations stopped the TDAFW pump, declared the pump inoperable, and entered TS 3.7.2.1 on August 10. Troubleshooting revealed that the governor valve control linkage was out of adjustment (cam follower bearing was not properly aligned in the cam plate cam slot) and the governor's stability compensation was not set correctly. Operation of the TDAFW pump in low flow conditions with an unstable governor could challenge the lift setpoint of the discharge relief valve and result in its opening. Excessive TDAFW pump speed oscillations were believed to challenge the overspeed trip feature of the TDAFW pump and could result in tripping the TDAFW pump when it is needed. On August 12, Millstone adjusted the governor's stability compensation to eliminate the oscillations, which dampened the governor response making it less responsive (more sluggish). They also corrected the problems identified above with the governor valve linkage by replacing the cam follower.

Subsequently, on November 4, 2013, during routine quarterly surveillance testing of the TDAFW system, the TDAFW pump tripped on overspeed during startup. At that time, Dominion believed the cause was water intrusion into the pump via condensate in the steam supply lines. An increased monitoring and surveillance plan was developed. Dominion then began performing surveillance runs weekly to demonstrate continued operability of the pump. On December 18, 2013, they experienced another overspeed trip when the 'D' steam line was unisolated following repairs to address a steam leak.

Dominion attributed the overspeed trip to condensate in the 'D' steam line. To address water intrusion concerns, Dominion implemented a number of compensatory measures and ran a number of surveillance tests to demonstrate operability.

On January 23, 2014, during the weekly surveillance run of the TDAFW pump, it again tripped on overspeed. Dominion did not attribute this trip to water intrusion because they had implemented corrective actions to prohibit condensate intrusion into the pump following the two previous trips. Dominion identified, during subsequent troubleshooting, that a linkage connecting a lever to the cam plate was installed reversed, such that the shoulder on the female end would interfere with the prongs of the connecting lever. In addition, Dominion identified that the thrust transmitted on the valve stem was ~ 70 lbf, whereas a value of 300 lbf was expected. Following the granting of a Notice of Enforcement Discretion (NOED) to complete repairs on January 26, 2014, the TDAFW pump was returned to service and declared operable at 5:05 a.m. on January 27, 2014.

Additional details regarding recent Unit 3 TDAFW system issues can be found in NRC Integrated Inspection Reports (IRs) 05000423/2013004, 2013005, and 2014002. Notably, two of these reports documented Green findings (FIN) for Dominion's failure to complete an adequate and timely operability determination on TDAFW governor control oscillations and failure to follow their operability procedure to establish adequate compensatory measures to restore TDAFW reliability.

Dominion completed an RCE on the Unit 3 TDAFW failures in the second quarter of 2014. Additionally, Millstone launched a focus team tasked to review the past ten years of operational practice, preventive maintenance, industry experience, and other information for the TDAFW pump.

1.2 Special Inspection Scope

The NRC conducted this inspection to gain a better understanding of the circumstances involving the TDAFW pump overspeed trips during surveillance testing on November 4, 2013, December 18, 2013, and on January 23, 2014. The inspection team used NRC Inspection Procedure 93812, "Special Inspection," as a guide to complete their review. Additional inspection and review activities were outlined in the special inspection team charter, provided as Attachment B. The special inspection team reviewed procedures, corrective action documents, work orders, engineering analyses, and the RCE prepared by Dominion. In addition, the team conducted equipment walkdowns and interviewed key plant personnel regarding the discovery and resolution of the condition. A list of site personnel interviewed and documents reviewed are provided in Attachment A to this report.

1.3 Preliminary Conditional Risk Assessment

The failure of the TDAFW pump involved a failure of safety-related equipment. There have been equipment and performance issues related to this pump dating back to the conclusion of the outage in May 2013. Additionally, in the 2013 3rd Quarter Resident Inspection Report (05000423/2013-004), there is a finding that involves an inadequate operability determination related to governor performance on this pump.

Using the Millstone Unit 3 SPAR model, the Region I Senior Reactor Analyst (SRA) calculated the conditional core damage probability (CCDP) for the TDAFW pump

overspeed trip failures and associated unavailability times. Based upon best available information and a review of the known problems with the TDAFW pump since August 2013, the SRA made the following conservative assumptions to estimate the risk associated with the unreliability and unavailability of the pump: 1) the exposure time of the problems involving the turbine-driven pump date back to restart of the unit on August 12, 2013, and includes approximately 4,000 hours; 2) during surveillance testing conducted between November 4, 2013, and January 12, 2014, the TDAFW pump failed on demand (due to overspeed) 3 times out of approximately 9 starts; this 0.33 failure probability is used rather than the nominal 0.00649 value, to reflect actual failure to start probability for the exposure period; and 3) conservatively, no operator recovery credit following an overspeed trip failure was assigned. The SRA used the zero Test & Maintenance model for this risk assessment, in accordance with established guidance.

The calculated CCDP was 1.52E-6. If an operator recovery credit was to be assigned of a 1 in 10 chance of failure; the estimated revised CCDP would be 1.52E-6 X 1/10 = 1.52E-7. If the external event contribution were to be added, due to the importance of the TDAFW pump for fire mitigation, preliminary values obtained from the licensee would result in the CCDP increasing to the middle of the E-6 range. Based upon best available information and the uncertainty of assigning a recovery credit because of the unknown TDAFW pump failure mechanism(s), the 1.52E-6 CCDP value was selected to represent the estimated risk increase associated with the IMC 0309 reactive inspection assessment. This CCDP value placed the risk in the "No Additional Inspection" to "Special Inspection Team" overlap region. Based upon the preliminary CCDP estimate of low E-6 range, in accordance with IMC 0309, this event fell within the range for a Special Inspection Team.

2. SPECIAL INSPECTION AREAS

2.1 Review of the Notice of Enforcement Discretion (NOED)

a. Inspection Scope

On January 23, 2014, the Unit 3 TDAFW pump failed a required surveillance test. During the starting sequence, the pump tripped on overspeed due to mechanical binding in the turbine governor valve linkage. Dominion entered TS limiting condition for operations (LCO) 3.7.1.2(a) action (c) which provided up to 72 hours to repair the failed pump before requiring Unit 3 to be shutdown to Mode 3. Troubleshooting efforts revealed that the mechanical linkage between the mechanical governor and the turbine governor control valve had binding in the open position due to a linkage being reversed. Additionally, a worn cam follower bearing was replaced along with the governor assembly. Although repairs had been completed, it became apparent that the required post-maintenance tests, including a full flow test at full power, could not have been completed prior to the expiration of the LCO on January 26, 2014. Dominion requested enforcement discretion from compliance with TS 3.7.1.2 for a period of 72 hours. The NRC reviewed the request in accordance with IMC 0410, "Notices of Enforcement Discretion," and granted a one-time 48 hour extension to required action statement (C) of TS LCO 3.7.1.2(a). Dominion completed the post-maintenance testing and restored the TDAFW pump to an operable status within the additional time granted. An Unresolved Item (URI) was opened in accordance with the IMC 0410 process and was documented in IR 05000423/2014002, Section 4OA3. The team reviewed the sequence

of events and details of the issue to determine whether there should be any enforcement action associated with the granting of the NOED.

b. Findings and Observations

No findings were identified.

IMC 0410 provides the NRC staff a process to exercise enforcement discretion for unanticipated temporary noncompliances with applicable TS LCO or other license conditions. IMC 0410, Attachment 1, "NOED Checklist," item 07d, asks, "Did the licensee provide information that shows the licensee fully understands the cause of the situation that has led to the NOED request?" The inspection team concluded that, at the time of the NOED request, Dominion's information was complete and accurate. However, in hindsight and based on review of the issue and Dominion's RCE, Dominion had not fully understood the direct cause of the overspeed events. Specifically, in the RCE Attachment 8, it states "the decision that the cause was the governor or the identified linkage problems, did not remove the direct cause of the overspeed trips, leaving the TDAFW pump susceptible to future trips." The installation of the wrong cam follower bearing was identified on January 30, 2014, following the end of the NOED period and Dominion declaring TDAFW operable. Additionally, IMC 0410, section 03.05 describes inappropriate uses of the NOED process and states that NOEDs are not appropriate to troubleshoot maintenance issues. The team concluded that, in hindsight, Dominion had not fully identified the direct cause of the TDAFW situation that led to the NOED request. This inadequate understanding of the cause is captured as part of the apparent violation discussed in section 2.5 of this report.

The NOED specified a list of prerequisites and compensatory actions to mitigate risk that were required to be verified and completed prior to the 48 hour extension becoming effective. Inspectors reviewed and verified Dominion's satisfactory completion of the specified requirements in the NOED. The URI documented in section 4OA3 of IR 05000423/2014002 is closed.

2.2 Event Timeline

a. Inspection Scope

The team generated a timeline of events which captured the failures, maintenance evolutions, and tests performed on the TDAFW system. The team also reviewed timelines located in Dominion's RCE associated with TDAFW performance. The timeline is attached in Attachment B of this inspection report.

b. Findings

No findings were identified.

2.3 Review of Maintenance

a. Inspection Scope

The team evaluated the adequacy and completeness of the maintenance on the TDAFW system, including preventive maintenance, maintenance practices, procedural guidance, post-maintenance testing, and supervisory oversight. The team independently evaluated selected procedures, preventive maintenance strategies, CRs, system health reports, and associated work orders. In addition, the team reviewed the RCE, conducted equipment walkdowns, and interviewed key station personnel. For weaknesses identified, the inspectors verified that appropriate corrective actions have been planned or taken.

b. Findings and Observations

1. Findings

Introduction. The inspectors identified a self-revealing Green NCV of TS 6.8.1, "Procedures and Programs," involving Dominion's failure to maintain an adequate maintenance procedure to ensure reliable performance of the TDAFW system. Specifically, TDAFW responded to an August 2013 reactor trip but was subsequently shut down and declared inoperable after observed flow and pressure oscillations. Dominion staff discovered the control valve linkage misaligned due to a loose cam follower bearing retaining nut.

Description. During the Spring 2013 Millstone Unit 3 refueling outage, the TDAFW pump governor valve and governor valve linkage were overhauled using work order 53102204245 to correct a governor valve packing steam leak. Work order step 9 stated, "IAW C MP 711, reconnect control valve linkage." Maintenance procedure, C MP 711, "Terry Turbine Governor Control Valve Maintenance," Revision 002-01, step 4.6.1.a stated in part, "ASSEMBLE and INSTALL the following as necessary, ensuring there is *no* load on valve stem: valve stem connector and cam follower assembly to cam plate." The maintenance was completed on May 7, followed by post-maintenance testing and declaring the system operable.

On August 9, Unit 3 experienced an automatic reactor trip on low steam generator water level. The TDAFW system actuated and provided flow in response to the trip. At 109 minutes into the response and coincident with being placed on minimum flow, equipment operators reported flow and pressure oscillations to the main control room. When TDAFW was placed on minimum flow, flow oscillations increased and discharge pressure spikes above the relief valve setpoint but below the overspeed setpoint were observed. At the request of the equipment operator and based on both low flow demand and availability of motor-driven AFW pumps, Operations shutdown the TDAFW pump and declared it inoperable. During a subsequent TDAFW walkdown, a Dominion engineer noted that the cam follower bearing was not properly aligned in the linkage cam plate (CR 522896). The retaining nut that retains the bearing assembly had backed off, came in contact with the fulcrum support, and resulted in the bearing being displaced 3/8" out of the cam slot, almost its full width. As part of the repair, Dominion implemented a revision to the C MP 711 procedure to require application of thread-locker to the cam follower bearing retaining nut during reassembly and completed post-maintenance testing to include a full-flow test to the steam generators.

Regulatory Guide (RG) 1.33, Appendix A, paragraph 9.a requires, in part, that "Maintenance that can affect the performance of safety-related equipment should be properly pre-planned and performed in accordance with written procedures, documented instructions, or drawings appropriate to the circumstances. Skills normally possessed by qualified maintenance personnel may not require detailed step-by-step delineation in a procedure." In this case, the C MP 711 instructions did not include specific steps for tightening the nut that retains the cam follower bearing assembly. The inspectors determined that this failure demonstrated its ability to affect safety-related equipment performance and therefore mandated that specific procedural guidance exist. Despite this, the inspectors also concluded that TDAFW did not lose its function given the appropriate response to the August 2013 reactor trip, the pump's continued operation when placed on minimum flow, the inability of the bearing to disassemble based on physical constraints, and the determination that, under postulated design basis conditions, the gradual adjustments to lower TDAFW discharge flow to meet decay heat removal demand would support continued satisfactory operation, despite the degraded bearing condition.

Analysis. Failure to maintain an adequate maintenance procedure that adversely impacts TDAFW performance was a performance deficiency. The finding was more than minor because it is associated with the procedure quality attribute of the Mitigating Systems cornerstone and adversely affected its objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, the maintenance procedure did not provide sufficient written instructions to ensure adequate torque of the retaining nut and thereby reliable performance of the TDAFW system three months after reassembly. The finding was evaluated using IMC 0609, Attachment 4 and Appendix A, Exhibit 2.A, and determined to be of very low safety significance (Green) since it was not associated with a design or qualification deficiency, not a loss of system/function, and not an actual loss of its TS function. Specifically, the inspectors concluded there was not a loss of function based on the TDAFW's appropriate response to the August 2013 reactor trip, the pump's continued operation when placed on minimum flow, the inability of the bearing to disassemble based on physical constraints, and the determination that, under postulated design basis conditions, the gradual adjustments to lower TDAFW discharge flow to meet decay heat removal demand would support continued satisfactory operation, despite the degraded bearing condition.

This finding had a cross-cutting aspect in the area of Human Performance, Documentation, in that licensee organizations are expected to create and maintain complete, accurate, and up-to-date documentation. Specifically, Dominion did not maintain a comprehensive, high-quality, maintenance procedure that was thorough to assure assembly of critical TDAFW components. [H.7]

Enforcement. TS 6.8.1 requires, in part, that "Written procedures shall be established, implemented, and maintained covering the activities referenced below: a. The applicable procedures recommended in Appendix A of RG 1.33, Revision 2, February 1978." RG 1.33, Appendix A, paragraph 9.a requires, in part, that "Maintenance that can affect the performance of safety-related equipment should be properly pre-planned and performed in accordance with written procedures, documented instructions, or drawings appropriate to the circumstances. Skills normally possessed by qualified maintenance personnel may not require detailed step-by-step delineation in a procedure." Contrary to this, on May 7, 2013, Dominion did not maintain an adequate maintenance procedure, C MP

711, "Terry Turbine Governor Control Valve Maintenance," to ensure proper assembly of the control valve linkage. As a result, on August 9, 2013, during a reactor trip response, the TDAFW control valve linkage became misaligned, degraded pump performance, and the train was subsequently shutdown and declared inoperable. Dominion revised the procedure to require thread-locker and used the procedure to reassemble the linkage. Because this violation was of very low safety significance (Green), and Dominion entered this issue into their CAP, this violation is being treated as an NCV, consistent with Section 2.3.2.a of the Enforcement Policy. **(NCV 05000423/2014008-001, Failure to Maintain Adequate Maintenance Instructions for the Turbine Driven Auxiliary Feedwater Pump Governor Control Valve Linkage)**

2. Observations

In addition to the corrective action violation above, the inspectors identified several minor issues that contributed to TDAFW degraded system performance.

Heim Joint Configuration

During corrective maintenance following the January 2014 TDAFW overspeed trip, Dominion identified that the cam plate linkage at the connective lever had been installed in reverse. Dominion immediately corrected the configuration and discovered evidence through a subsequent investigation that the linkage, also known as a Heim joint, had been installed incorrectly since 2008. A Dominion contractor determined that friction in this linkage was not considered a cause of the overspeed trips since the force required to cause a lock-up of the linkage was in excess of those forces observed during pull tests during valve disassembly and reassembly. Dominion revised their maintenance procedure to ensure the linkage connecting rod was installed correctly (CA281255). This issue of incorrect installation was determined to be minor in accordance with IMC 0612.

Governor Valve Stem Stroke

Following the January 2014 TDAFW overspeed trip, inspectors completed field observations during Dominion's corrective maintenance including control valve linkage and stem setup. Procedure C MP 711, "Terry Turbine Governor Control Valve Maintenance," Revision 2-02, section 4.1.2, indicated that the as-found linkage condition should be an approximate valve travel of 0.625". The team noted, through field observations, an as-found stroke length of a nominal 0.860" for the governor valve stem, approximately 38 percent greater than the nominal value. The stem stroke length setting above the nominal target value was also confirmed through a review of data compiled from strain gauges that Dominion had installed on the stem prior to the last overspeed event on January 23, 2014.

Dominion and vendor analyses, subsequent to the overspeed events, concluded that setting the cam follower higher in the cam plate slot results in a further open control valve position and an associated increase in the stem thrust required to overcome backpressure and dynamic loading during a system start. Therefore, a setting of 0.860" versus the stated approximate valve stem travel of 0.625" would have resulted in a greater challenge to the governor and linkage to overcome the initial backpressure to initiate stem movement and prevent an overspeed condition. The team noted that Dominion's RCE had not addressed or identified that the as-found stroke length had

been a nominal 38 percent above the previous maintenance procedure nominal value. This was also not discussed as a contributing cause although the previous setup would have reduced the available stem thrust. During the inspection, Dominion concluded that the vendor's analysis of linkage forces and conclusions were not significantly impacted by the as-found stroke length. However, the team noted that if the cam follower coefficient of friction was assumed to have been 0.5, this would have increased the force required on the linkage lever arm attached to the cam plate by a nominal 16 percent for the target stem thrust.

On January 25, 2014, Dominion identified that a Woodward Governor drawing existed that had information not previously contained in maintenance procedures. C MP 711 was updated in revision 2-05 to reflect that excessive valve travel can cause binding in the cam plate due to the roller bearing traveling into an area not normally used. However, the team noted that direction in step 4.1.8 is for a minimum valve travel of 0.625" with no associated limit placed on the maximum allowable valve travel in the open position or cam follower position in the plate. Dominion initiated CR 548174 to further investigate the effect of the maximum stem travel to determine if a bounding value needs to be included in the procedure. The team noted that the actual as-left stem stroke was a nominal 0.680" after the January 26, 2014, maintenance and this setting has been verified through several tests to be adequate. Dominion had previously identified the need to revise their procedures and had left the stem stroke setting close to the targeted range, which effectively reduced the force required for stem movement. The team determined the stroke length issue to be of minor significance in accordance with IMC 0612.

Governor Linkage Pull Test

The team noted that Dominion's maintenance procedures included provisions for a pull test designed to perform a static check of the forces required through the linkage on the valve stem to stroke the governor valve. The test consisted of installation of a gauge block on the stem. This was to ensure that the pull test was performed consistently near the full open to full closed stroke length of 0.625". As noted above, the team determined that the previous pull tests may not have consistently been measuring the maximum forces within the linkage for the static test because the as-found stem stroke length had previously been 0.860". This pull test had been performed by Dominion to gain confidence that there was no binding within the governor valve and linkage above the established 26 pounds for the acceptance criterion. However, the team noted that because the actual stem stroke length exceeded the 0.625", the potential existed that the pull test had not effectively been measuring the maximum forces required with the cam follower deeper within the cam slot (a more open valve). Additionally, the RCE had eliminated the direct cause of the overspeed events for other nonconforming or degraded items identified within the governor linkage, in part, based on the assumption that the pull test would have measured inadequate forces during the valve stroke with the linkage. The team noted that this had not been a conservative assumption based on the as-found stem stroke being greater than the assumed 0.625" and the use of the gauge block which would have limited the stem from full travel based on the gauge block installation. The team determined that this was a weakness in the vendor evaluation attached to the RCE, but could not conclude that the direct cause determined would have changed. Dominion wrote CR 551507 to evaluate this and had already been considering changes to the pull test based on the knowledge that the previous testing had not captured the linkage binding issues. Discussions with Dominion engineering

indicated they are evaluating incorporation of dynamic forces into the test to improve the capability of detecting any conditions adverse to quality within the governor linkage. This issue was determined to be minor in accordance with IMC 0612.

Calibration Acceptance Criterion for Electrical Overspeed Trip

The team questioned why station calibration procedures for the electrical overspeed loop allowed a tolerance which could potentially result in an electrical overspeed trip during the most challenging load conditions. Specifically, when pump flow is lowered or removed from the steam generators and transitioned to minimum flow conditions, this effectively challenges the control system to respond and maintain the desired speed setting.

The team noted that the existing acceptance criteria of 4752 ±120 rpm could result in leaving the setpoint at a low enough value where an inadvertent trip could occur during TDAFW load changes. Specifically, during load change demands such as removing flow to steam generators to control level, actual plant data showed that turbine speed overshoots the controller setpoint and rises above the lower level of the overspeed trip acceptance criterion. Actual full flow test results had shown speed overshoots above 4632 rpm when removing load from the pump which had been the acceptable low end of the speed band. The team determined that the instrument calibration procedure acceptance criteria for TDAFW electrical overspeed trip loop accuracy were inadequate in that it would allow the potential to trip the TDAFW pump during load changes. The loop allowable tolerance was not adequate given the low margin to the trip. The team determined this to be a minor violation in that actual test data reviewed for as-found trip setpoints had showed little to no drift in the instrument loop relative to the tested overspeed trip setting. Dominion entered the issue into their CAP (CR 547231) to ensure the allowable band could not result in inadvertent overspeed trips when Operations performs load changes. This issue was determined to be minor in accordance with IMC 0612.

2.4 Review of Operating Experience

a. Inspection Scope

The team reviewed and evaluated Dominion's application of pertinent industry and internal operating experience and evaluation of potential precursors including the adequacy of any actions taken in response to the operating experience or precursors. Specifically, the team reviewed both internal and external operating experience involving TDAFW pump failures and actions taken by the Millstone staff to identify and address these types of failures. In addition, the team examined the specific issues associated with linkages between the governor and control valve and control valve packing leakage to assess any new generic issues of industry interest for prompt communication and dissemination.

b. Findings and Observations

No findings were identified.

Operating Experience

The inspectors determined that while Dominion had considered pertinent industry and internal operating experience, Dominion had not properly evaluated NRC Information Notice (IN) 2010-020, "Turbine-Driven Auxiliary Feedwater Pump Repetitive Failures." IN 2010-020 states, in part, that the operating experience examples discussed "illustrate the importance of ensuring that any condition adverse to quality affecting the TDAFW system is fully understood so that appropriate corrective actions can be taken. Repetitive failures... may indicate that although the direct cause of the original condition was addressed, the root cause remains uncorrected." Inspectors determined there were no CAP entries regarding IN 2010-020 and there was nothing in the TDAFW system health report related to the IN. Dominion's RCE for this issue concluded that the events described in IN 2010-020 "were not specifically applicable to the Unit 3 TDAFW pump overspeed trips." Based on Dominion's failure to identify and fully understand the cause of the overspeed trips, the inspectors determined that the IN 2010-020 discussion was pertinent to the Millstone 3 TDAFW condition. The inspectors concluded this issue was minor in accordance with IMC 0612.

Relief Valve Margin Issue

The team determined that challenges to the TDAFW discharge relief valve margin continue at the station. Millstone 3 issued Licensee Event Report (LER) 2010-004 in August 2010 for TDAFW being inoperable due to a degraded discharge relief valve, RV45. Specifically, minimal margin between the relief valve setpoint and TDAFW discharge pressure while on recirculation flow caused the relief valve to leak past its seat. The LER stated that "as corrective action to prevent recurrence, design changes are being evaluated to modify the system configuration." The team noted that similar lifts of this relief valve were observed during tests within the timeframe of the Special Inspection Team scope. The inspectors questioned the operability of the Unit 3 TDAFW pump since the relief valve may be challenged if the turbine was close to the overspeed setpoint (CR 538720). Specifically, peak discharge pressure was within the ± 3 percent American Society of Mechanical Engineers tolerance of the relief valve. As a result, an operability determination, OD000577, was written to address this operability concern. One of the required actions of OD000577 was to tighten the as-left tolerance to 1850 to 1868.5 psig (+1/- 0 percent). The inspectors concluded this issue was minor in accordance with IMC 0612.

2.5 Review of Causal Analyses

a. Inspection Scope

The team evaluated the adequacy of Dominion's response to the TDAFW system failures, including Dominion's cause analyses, extent of condition, corrective actions, and failure mode considerations. Further, the team reviewed Dominion's final RCE for the TDAFW system failures. The team reviewed plant drawings, videos, procedures, and associated system modifications. In addition, the team conducted a walkdown of the TDAFW system and interviewed key Millstone personnel.

b. Findings

Introduction. The inspection team identified a self-revealing apparent violation of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," involving Dominion's failure to promptly identify and correct a condition adverse to quality. Specifically, the Unit 3 TDAFW pump was operated from May 2013 through February 2014 in an adverse configuration due to installation of an inappropriate cam follower bearing within the turbine control valve linkage. As a result of this adverse configuration, the pump experienced three overspeed trips during the subject timeframe. As a consequence, Dominion violated TS 3.7.1.2, since TDAFW was determined to be either failed or unreliable for greater than the TS allowed outage time.

Description. On May 12, 2013, during the Millstone Unit 3 Spring 2013 refueling outage, preventive maintenance was performed on the TDAFW pump system that included a governor control valve overhaul, associated work on the valve stem linkage, and cam follower bearing replacement. On August 9, TDAFW started on an automatic actuation signal, coincident with a Unit 3 reactor trip. When the demand for maximum auxiliary feedwater flow (two motor-driven pumps and the TDAFW pump in service) was no longer needed, TDAFW was taken to minimum flow conditions and subsequently shutdown. During a walkdown of the system post-actuation, Dominion observed that the cam follower bearing on the control valve stem connector rod was misaligned. In response, Dominion replaced the cam follower bearing, reassembled the stem connector assembly, and completed post-maintenance testing on August 11, 2013.

On a routine surveillance test on November 4, the TDAFW pump tripped on electrical overspeed during its initial startup acceleration. Dominion captured this issue as CR 531536 and attributed this trip to condensate in the steam supply lines. Dominion implemented compensatory measures to include ensuring the steam traps were adequately draining the lines, isolating the 'D' steam supply line, and completing weekly operating surveillances to demonstrate reliability. On December 18, the 'D' steam supply line was reopened for a TDAFW surveillance test and the TDAFW pump tripped on electrical overspeed during initial startup acceleration. Dominion captured this issue as CR 535411 and incorporated it in an existing RCE (RCE 001111) started from the November overspeed trip. During a surveillance test on January 23, 2014, TDAFW tripped again on electrical overspeed during the initial startup. During Dominion's investigation and troubleshooting, the maintenance staff discovered that the Heim joint on the linkage between the governor and the TDAFW control valve was installed in reverse (CR 537933). During this at-power troubleshooting and repair activity, Dominion corrected the inverted Heim joint, replaced the cam follower bearing, replaced the governor, checked governor valve internals, and conducted a full-flow test following the successful request and receipt of an NOED to exceed the 72-hour TS allowed outage (ML14030A601).

Following the successful test and after declaring the TDAFW system operable, Dominion determined that the installed cam follower bearing, that rolls in the cam plate slot, was an inappropriate part. Specifically, the installed bearing lacked a copper-alloy insert that provided inherent lubricity. On February 3, 2014, Dominion took the TDAFW pump out of service, replaced the cam follower bearing with the correct part, successfully completed post-maintenance testing, and declared TDAFW operable. Subsequently, Dominion reported this condition under 10 CFR 50.73(a)(2)(i)(B) for a condition

prohibited by TSs given that the TDAFW was either failed or unreliable for greater than the TS allowed outage time (ML14189A071).

With respect to troubleshooting of the overspeed events, Dominion's RCE determined that the November 2013 troubleshooting was narrowly focused on the presence of condensate in the steam supply lines and did not provide adequate justification for excluding other failure modes. MA-AA-103, "Conduct of Troubleshooting," Revision 10, step 3.6.10 requires documentation of the reason for eliminating failure modes on the failure mode tree. Dominion also noted that complex troubleshooting teams were not established for the subsequent overspeed trips. MA-AA-103, step 3.4.1 requires complex troubleshooting if the activity requires involvement from more than two disciplines, requires specialized personnel such as vendors, or poses an operational risk. Step 3.4.3 requires a team for challenges associated with short duration LCOs and other significant equipment problems.

In addition to the troubleshooting performed, the inspectors noted other opportunities for Dominion to identify the overspeed cause. On December 12, 2013, CR 534108 documented rust-colored residue on the turbine linkage, specifically the jam nut, cam follower, and fulcrum support plate slot. Dominion determined that "corrosion does not impact current operability" and closed the CR to trending. On December 5, 2013, CR 534403 documented that the control valve and cam plate were moving in discrete versus smooth movements. Subsequent to the overspeed events, the governor vendor agreed that a sticking linkage could cause the discrete movements. This CR was closed to a work order to troubleshoot and repair the control valve packing. On December 19, 2013, CR 535491 documented an equipment operator's observations that the cam follower did not rotate in the linkage, dragged, appeared to be cocked at the end of the surveillance, and the as-left condition did not match the as-found condition. This CR was closed with no additional corrective actions. During linkage corrective maintenance and installation following the January 2014 overspeed trip, rough spots were found on the cam follower bearing and it was replaced.

The team's independent review and assessment of RCE 001111 and associated TDAFW pump troubleshooting plans identified additional observations regarding Dominion's use of troubleshooting and the CAP. Formal troubleshooting had not been performed as required by MA-AA-103 for the August 2013 oscillations. Second, indications of rubbing/scuffing marks on the outer diameter surface of the cam follower observed by Dominion on August 9, following the reactor trip and TDAFW actuation, were not documented in the CAP (CR 539041). Finally, the inspectors noted that Dominion installed a sensor on the control valve stem to monitor the forces applied in early January 2014 after the pump had tripped twice on overspeed conditions.

Overall, the inspectors determined that the incorrect cam follower bearing was a condition adverse to quality that was within Dominion's ability to foresee, correct, and should have been prevented. The inspectors did not identify a performance deficiency associated with the receipt inspection of the incorrect bearing as the critical characteristics were below the thresholds established by the vendor and the manufacturer. A Noncompliance report was submitted on March 17, 2014, in accordance with 10 CFR 21.21(d)(3)(i) under Event Notification System 49923. The inspectors considered August 11, 2013, as the first reasonable opportunity for Dominion to identify the incorrect bearing.

Analysis. The team determined that Dominion's failure to promptly identify and correct a condition adverse to quality constituted a performance deficiency. The issue was evaluated in accordance with IMC 0612, Appendix B, and was determined to be more than minor since it was associated with the equipment performance attribute of the Mitigating Systems cornerstone and adversely affected its objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, TDAFW pump operation with the incorrect cam follower bearing resulted in three TDAFW pump overspeed trips thereby reducing the reliability of a risk-significant, safety-related mitigating system. The issue was evaluated in accordance with IMC 0609, Appendix A, Exhibit 2, and was determined to require a detailed risk evaluation based on the finding representing an actual loss of a single train for greater than its TS allowed outage time.

As detailed in Attachment D of this report, a detailed risk evaluation concluded that the increase in core damage frequency associated with the reduced reliability of the TDAFW pump was estimated to be in the mid to high E-6 range, or White (low to moderate overall safety significance). As discussed in the attached detailed risk evaluation, the dominant core damage sequences contributing to the risk significance of this performance deficiency involve postulated fire scenarios that would cause operators to abandon the control room due to smoke, fire or loss of control functions. In these postulated low frequency and severe fire events, the operation of the TDAFW pump is relied upon, and solely credited, for providing steam generator make-up and associated decay heat removal, per station emergency operating procedures. In recognition of the singular importance of the TDAFW pump for mitigation of fires leading to the abandonment of the control room, Dominion has completed or initiated emergency operating procedural improvements to support operator actions for TDAFW pump recovery and use of the motor-driven AFW pumps if free from fire damage. The team understands that Dominion is also considering the development of primary "feed and bleed" procedure steps to provide an alternative core damage mitigation success path. This detailed risk evaluation was reviewed during a Significance and Enforcement Review Panel held on July 29, 2014. The finding no longer presents an immediate safety concern because Dominion corrected the condition adverse to quality in February 2014.

This finding had a cross-cutting aspect in Human Performance, Consistent Process, where individuals use a consistent, systematic approach to make decisions and risk insights are incorporated as appropriate. Specifically, Dominion did not implement consistent, systematic approaches to resolve the condition as evidenced by their inadequate and inconsistent use of CAP and troubleshooting. [H.13]

Enforcement. 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," states, in part, that "measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected." Contrary to this, from August 11, 2013, to February 3, 2014, Dominion did not promptly identify and correct an inappropriate cam follower bearing installed in the Millstone 3 TDAFW system. The incorrect part had been installed since May 12, 2013, and the TDAFW system experienced three overspeed trips on initial starts. As a result of the failure to correct the condition, Dominion also violated TS 3.7.1.2, since TDAFW was determined to be either failed or unreliable for greater than the TS allowed outage time. There were no actual

safety consequences. Immediate corrective actions included replacing the cam follower bearing with the correct part, successfully completing post-maintenance testing, and entering the issue in Dominion's CAP as CR 538743 and CR531536. This issue is being characterized as an apparent violation in accordance with the NRC's Enforcement Policy, and its final significance will be dispositioned in separate future correspondence. **(Apparent Violation 05000423/2014008-02, Failure to Promptly Identify and Correct a Turbine-Driven Auxiliary Feedwater Condition Adverse to Quality)**

2.6 Review of Operability and Reportability

a. Inspection Scope

The team reviewed Dominion's evaluation of conditions surrounding the issue for reportability to verify Dominion met the proper reporting requirements of 10 CFR 50.72 and 10 CFR 50.73. Additionally, the team reviewed Dominion's evaluation of the issue under 10 CFR 21. Finally, the team reviewed the adequacy of Dominion's assessments of past operability with regards to the TDAFW system.

b. Findings and Observations

No findings were identified.

10 CFR 50.73

Subsequent to completion of the RCE, Dominion determined that TDAFW performance constituted a reportable condition. Specifically, under CR 531536, Dominion determined that firm evidence of a discrepant condition existed for periods of time exceeding TS 3.7.1.2 LCO allowed outage time and was, therefore, a condition prohibited by TSs. Dominion submitted the associated LER on June 30, 2014.

10 CFR 21

On March 17, 2014, Dresser-Rand issued a Defects and Noncompliance report in accordance with 10 CFR 21.21(d)(3)(i) under Event Notification System 49923. Specifically, ten bearings were shipped under part number 75439A07 to Dominion Nuclear in 2006 that were Seal Master Com 8 bearings that did not have an aluminum bronze insert. Dresser-Rand acknowledged that extended operation without lubrication will result in the Seal Master Com 8 bearing seizing. Customers were directed to visually inspect their bearings for the bronze insert and to replace the bearing at the first opportunity if no insert was visible. On April 17, 2014, Dresser-Rand submitted their final report of the defect under their own report number 47.

Operability Determinations

Following the November 4, 2013, overspeed trip, Dominion completed an operability determination (OD000561) that attributed condensate in the steam supply lines as the cause. In late February 2014, an engineering technical evaluation (ETE-CME-2014-1002) determined that condensate accumulation in the steam lines was consistent with Millstone Unit 3 operational experience and did not adversely impact TDAFW operability.

This was also captured in CR 541414. In total, from November 2013 through January 2014, OD000561 had been revised five times. Dominion's RCE identified numerous challenges with their implementation of the operability process. Examples included one revision that involved approval of an uncontrolled copy, one revision that was approved without full alignment of the Operations department, and consecutive revisions that credited condensate before and after the steam supply air-operated isolation valves respectively as the cause for overspeed trips without an explanation for the change. Further, the first few revisions included contradictory sections. Specifically, the linkage/control valve stem failure mode had been "eliminated based on satisfactory operation of the turbine" while a compensatory measure of operating TDAFW at an increased frequency had been established to verify that potential valve stem binding was not occurring. IMC 0326, "Operability Determinations & Functionality Assessments for Conditions Adverse to Quality or Safety," states, in part, that "the supporting basis for the reasonable expectation of SSC [structure, system, and component] operability should provide a high degree of confidence that the SSCs remain operable" and that "the standard of 'reasonable expectation' is a high standard." The inspectors questioned Dominion on whether they had identified an adverse trend in operability determinations based on the sequence described above as well as two NCVs related to operability determinations documented in 2013 NRC IRs. Dominion's Nuclear Oversight department had identified this as an area for improvement in December 2013 (CR 535412) and Engineering documented their role in this process as a gap to excellence in February 2014 (CR 540138). The inspectors concluded this issue was minor in accordance with IMC 0612.

4OA6 Meetings, Including Exit

On May 9, 2014, the inspectors presented the inspection results to Mr. Stephen E. Scace, Site Vice President, and other members of the Millstone staff. The inspectors verified that no proprietary information was retained by the inspectors or documented in this report.

On July 21, 2014, the inspectors presented the inspection results to Mr. Matthew Adams, Plant Manager, and other members of the Millstone staff. The inspectors verified that no proprietary information was retained by the inspectors or documented in this report.

ATTACHMENT A: SUPPLEMENTARY INFORMATION
ATTACHMENT B: SPECIAL INSPECTION CHARTER
ATTACHMENT C: TDAFW TIMELINE
ATTACHMENT D: DETAILED RISK SIGNIFICANCE EVALUATION

SUPPLEMENTARY INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

R. Acquaro	Unit 3 Shift Manager
M. Adams	Plant Manager
L. Armstrong	Director of Safety and Licensing
J. Barile	Nuclear Engineer III
A. Bussham	Organizational Effectiveness Manager
F. Cietek	Nuclear Engineer, PRA
T. Cleary	Licensing Engineer
D. Dodson	Supervisor, Nuclear Engineering
G. Closius	Licensing Engineer
M. Goolsbey	Manager – Millstone 3 Operations
C. Maxson	Manager, Nuclear Engineering, Site
G. McGovern	Supervisor, Nuclear Maintenance
J. Rigatti	Manager, Nuclear Site Engineering
P. Russell	Shift Manager
S. Scace	Site Vice President
D. Scott	Senior Engineer
M. Vezina	Component Engineer
B. Willkens	Manager – Millstone Excellence
H. Thompson	Contract Engineer
J. Barile	System Engineer
S. Coulter	Maintenance Lead
R. Witt	Contract ESI Engineer

LIST OF ITEMS OPENED, CLOSED, DISCUSSED, AND UPDATED

Opened

05000423/2014008-02	AV	Failure to Identify and Promptly Correct a Condition Adverse to Quality (Section 2.5)

Opened/Closed

05000423/2014008-01	NCV	Failure to Provide Adequate Maintenance Instructions for the Turbine Driven Auxiliary Feedwater Pump Governor Control Valve Linkage (Section 2.3)

Closed

05000423/2014002-01	URI	NOED Granted by NRC for TDAFW Pump Repairs on January 26, 2014 (Section 2.1)

LIST OF DOCUMENTS REVIEWED

Section 1R01: Adverse Weather Protection

CRs

531945	536654	534290	522911	537933	538172
514502	535411	531665	515988	534875	528526
535587	538019	487952	535881	531536	533234
520252	537883	532984	538007	535685	538015
522932	515999	537862	515950	515821	532536
511710	535744	538764	538755	538634	539069*
539142*	539024*	539041*	535491	534108	522896
539047*	539056	539064*	538473	537871	537940
538018	537863	538932*	538926*	538016	538942*
538961*	538785*	538812	538826	538929*	538945*
538825	538823	538813	538812	538720*	534403
536347	538082	536515	536564	538353	392003
392155	540001*	539506	547231	548736*	548268*
548740*	548143*	548174*	540277	540298	540305
554370*					

*NRC Identified during inspection

Procedures

MP 3720AC, Auxiliary Feedwater Pump Turbine Maintenance, Revision 005-13
PI-AA-300, Cause Evaluation, Revision 7
PI-AA-300-3001, Root Cause Evaluation, Revision 4
PI-AA-300-3002, Apparent Cause Evaluation, Revision 6
PI-AA-200, Corrective Action, Revisions 21 and 22
MA-AA-103, Conduct of Troubleshooting, Revision 10
OP-AA-100, Conduct of Operations, Revision 25
MP 3704A-303, Preventive maintenance Technique for Terry Turbine Trip Throttle Valve Linkage, Revision 003-002
MP 3704A-304, Preventive maintenance Technique for Terry Turbine Governor to Governor Control Valve Linkage Adjustment, Revision 002-001, Revision 002-002, Revision 002,05,
Form MP 3710AA-147D, Lubrication Maintenance Technique Terry Turbine Aux Feedwater Pump – Trip Throttle Valve Linkage, Revision 003-02
MP 3762AC, Terry Turbine Trip Throttle Valve Maintenance, Revision 004-00
WC 9, Station Surveillance Program, Revision 005-06
SP 3622.3, Auxiliary Feedwater Pump 3FWA*P2 Operation Readiness Test, Revision 017-18
C MP 711, Terry Turbine Governor Control Valve Maintenance, Revision 002-05,
IC3485I02, Turbine Driven AFW Pump Airpax Model 300 Electronic Tachometer, Revision 1
3670.1-011, Rad Waste Operation Unit 3 Default Tour Type, Pages 12-14 of 26, Revision 008-11

Surveillance Tests

SP 3622.3, Auxiliary Feedwater Pump 3FWA*P2 Operational Readiness Test, Revision 017-18, completed 2/4/14

SP 3622.9, TDAFW Pump Full Flow Test in MODE 1, Revision 000-01, dated 1/26 and 27/14
SP 3622.3, Auxiliary Feedwater Pump 3FWA*P2 Operation Readiness Test, Revision 017-13, performed 11/8/2013
SP3622.3-001, TDAFW Pump Operational Readiness and Quarterly IST Group B Pump Tests, Revision 014-05, performed 2/25/13, 5/17/13, 8/12/13, 8/13/13, 11/4/13, 11/6/13, 11/7/13, 11/16/13, 11/18/13, 12/2/13, 12/18/13, 12/18/13, 12/19/13, 12/20/13, 12/20/13, 12/26/13, 1/2/14, 1/10/14, 1/23/14, and 1/23/14
SP3622.3-002, TDAFW Overspeed Test (Using Main Steam), Revision 009-04, performed 1/26/14,
SP3622.3-002, TDAFW Overspeed Test (Using Compressed Air), Revision 001-02, performed 11/3/11, and 5/11/13
SP2622.3-001, AFP Turbine Overspeed Trip Test, Revision 005-07, performed 11/5/12
SP3622.3-003, TDAFW Pump Time Response Test, Revision 008-03, performed 8/26/13
SP3622.3-003, TDAFW Pump Time Response Test, Revision 008-04, performed 1/27/14
SP3622.3-004, ESF Building Emergency Ventilation System Test, Revision 009-004, performed 2/25/23
SP3622.3-005, TDAFW Pump IST Comprehensive Pump and check Valve Test, Revision 004-04, performed 8/12/2013, and 5/17/13
SP3622.3-008, Refuel Testing of TDAFW Pump Team Supply Non-Return Isolation Valves, Revision 000-003, performed 5/15/13
SP3622.8-001, Auxiliary Feedwater Train 'A' Valve Stroke Time Test, Revision 010-01 performed 1/28/13, 1/28/13, 7/16/13, and 10/8/13
SP3622.8-009, Auxiliary Feedwater Train 'B' Valve Stroke Time Test, Revision 000-06 performed 3/25/13. 6/17/13, 9/10/13, and 12/6/13
SP3622.8-012, TDAFW Pump Control Valves Stroke Time Test, Revision 000-02, performed 2/24/13, 5/13/13, 8/17/13, and 11/3/13
SP 3616A.1-002, Stroke Time and Failure Mode Text of 3MSS*AOV31A, B, D, 3MSS*AOV65; Stroke Time Test of 3MSS*MOV31A, B, and D, Revision 008-07, performed 2/25/13, 6/11/13, 6/27/13, 8/17/13, 9/17/13, 11/14/13, 11/16/13, 11/21/13, and 12/18/13
SP 3616A.1-012, TDAFW Pump Remote Position Indication Verification, Revision 000-03, performed 11/21/13

Work Orders

53102700183	53102204245	53102634186
53102656351	53102204245	53102634186
53102656351	53102677787	53102689251
53102689777	53102700183	M3 06 06228
M3 06 00466		

Drawings

EM-123A, Main Steam and Reheat, Revision 58
EM-130B, Feedwater System, Revision 47
MP 3704A-304, Terry Turbine Governor to Governor Control Valve Linkage Adjustment
Unit 3 Terry Turbine Seam Supply Drain Line Isometric For Information Only Drawings
DC C900178, Crosby Pressure Relief Valve, Revision A
800328D, Terry Turbine Electrical Schematic, Revision 2
25212-29736 Sh.13, The Terry Steam Turbine Co. Lever Diagram, Revision 11/29/07
25212-26923, P&ID Main Steam and Reheat, Revision 58
25212-26941, P&ID Turbine Generator and Feed Pump Oil Systems, Revision 23
25212-26945, P&ID Turbine Plant Miscellaneous Drains, Revision 37
25212-26930, P&ID Feedwater System SH2, Revision 47

25212-26930, P&ID Feedwater System SH4, Revision 27
25212-26930, P&ID Feedwater System SH3, Revision 25

Other Documents
Engineering Logs from March 2013 through January 2014

Operating Experience
IN 2010-20
IN 1994-66
IN 1993-51
IN 1990-05
Millstone 3 OE Tracking – MPS – IN10-20

Evaluations
MRE016681
OD000577, Prompt Operability Determination, Revision 0, dated 2/7/14
OD000571, Prompt Operability Determination, Revision 0, dated 1/25/14
CA276914
ACE 18312
ETE-CME-2014-1002, TDAFW Pump Steam Line Condensate Between 3MSS*AOV31A/B/D and 3MSS*MOV17A/B/D, Revision 0
RCE001111, Millstone 3 TDAFW Pump Trips on 11/4/13, 12/18/13, and 1/23/14, Revision 1
DM3-00-0309-07, Actual Speed Setting for MP3 Auxiliary Feedwater Pump/Turbine, dated 10/4/07
ETE-CME-2013-1026, Permissible Water Level for MPS3 Terry Turbine Drain Lines, Revision 0
ETE-MP-2014-1016, Technical Basis for Acceptability to Perform TDAFW Pump Full Flow Test during Operational Mode, Revision 0
ETE-CME-2013-11262, 50.59 for continuous flow through Steam Trap 3DTM-TRP16B Revision 3
ETE-MP-2013-1207, Unit 3 TDAFW Pump (3FFWA*P2) Speed Oscillations Experienced During 3R15 Testing Basis Form Operation, Revision 0

Miscellaneous
LCR 3FWA-040, Loop Calibration, Revision 1
Operations Standing Orders: SO-13-025, SO-13-027, SO-13-028, SO-14-001, SO-14-004, and SO-14-007
LER 05000423/1994-014
LER 05000423/1994-011
LER 05000423/2010-004
LER 05000423/2008-006
Operation Log Entries concerning TDAFW matters for 2013 through 2/3/2014
C MP 711, Terry Turbine Governor Control Valve Maintenance, Revision 002-02 performed 5/16/2013
MA-AA-103 Attachment 2, Terry Turbine Tripped on Overspeed Troubleshooting Plan dated 11/5/13
MA-AA-103 Attachment 2, Terry Turbine Tripped on Overspeed Troubleshooting Plan dated 12/19/13
MA-AA-103 Attachment 2, Terry Turbine Tripped on Overspeed Troubleshooting Plan dated 1/23/14
MA-AA-103 Attachment 4, Complex Troubleshooting Failure Mode/Cause Table dated 11/5/13

Unit 3 TDAFW Pump Governor Valve Linkage videos taken during surveillance test starts on 4/29/12, 3/31/14, 1/23/2014, 12/18/2013, 11/4/2013, and 8/12/2013
Engine Systems, Inc. Certificate of Conformance dated 10/30/13 for Governor S/N 2093192
Engine Systems, Inc. Test as Received Reports for Governor S/N 2093192 dated 2/21/2013
Engine Systems, Inc. Mechanical Governor Condition Report for Governor S/N 2093192 dated 2/22/2013.
Engine Systems, Inc. Test as Received Reports for Governor S/N 2082283 dated 3/28/2014.Engine Systems, Inc. Mechanical Governor Condition Report for Governor S/N 2082283 dated 3/28/2014
Woodward Governor specification Report for Part Number 9903-232-ESI dated 8/8/2005
Bingham-Willamette MSD-DS 4x6x10B Nameplate Information, 0-1 Revision 5
Purchase Order 45363353 dated 5/23/2005 for roller bearings
Purchase Order 45443567 dated 6/8/2006 for ten roller bearings
On-The-Job Training MP3 Terry Turbine Trip Linkage Adjustment, Revision 4
2014 Non License Training AFW2014 Just In Time Training MP3 Terry Turbine Operation
FWA061C Lesson Title: Auxiliary Feedwater System, Revision 6 ch2
FSAR 10.4.9 Auxiliary Feedwater System
Technical Data Sheet Safety & Relief Valves for 3FWA*RV45
Station Procedure Change Form for SP 3622.3, Revision 4 Change 1 dated 10/24/1990
VTM 25212-041-003, Terry Steam Turbine vendor manual, Revision 01
Specification SP-ME-691, Specification for General Thermal Insulation (Design and Installation) for Millstone Nuclear Power Station – Unit 3 dated 11/13/1981
Plant Process Computer Data Graphs of 3FWA*P2 Speed Versus Time for surveillances performed; 11/4/13, 11/5/13, 11/6/13, 11/12/13, 11/15/13, 11/18/13, 12/2/13, 12/18/13, 12/18/13, 12/19/13, 12/20/13, 12/20/13, 12/16/13, 1/2/14, 1/16/14, 1/10/14, 1/23/14, 1/26/14, and 1/27/14
FWA*P2 Governor Output Force vs. Cam Bearing Friction for Different Control Valve Stem Loads
Plant Process Computer Graphs of 3FWA*P2 Speed, Discharge Pressure, and Flowrate vs. Speed for surveillance starts performed 5/5/13, 5/15/13, 5/17/13, 8/9/13, 8/12/13, 11/4/13, 11/5/13, 11/6/13, 11/12/13, 11/15/13, 11/18/13, 12/12/13 and 12/20/13
Chart of TDAFW Pump Governor Linkage Forces versus Cam Follower Friction Coefficient, Cam Plate Slot Angle and Valve Position

LIST OF ACRONYMS

10 CFR	Title 10 of the *Code of Federal Regulations*
CAP	Corrective Action Program
CCDP	conditional core damage probability
CR	Condition Report
Dominion	Dominion Nuclear Connecticut, Inc
IMC	Inspection Manual Chapter
IN	Information Notice
IR	Inspection Report
LCO	limiting condition for operation
LER	licensee event report
Millstone	Millstone Power Station
NCV	Non-cited violation
NOED	Notice of Enforcement Discretion
NRC	Nuclear Regulatory Commission
RCE	Root Cause Evaluation
RG	Regulatory Guide
SDP	Significance Determination Process
SRA	Senior Reactor Analyst
SSC	structure, system, or component
TDAFW	turbine driven auxiliary feedwater
TS	Technical Specifications
URI	Unresolved Item

Special Inspection Charter
Millstone Nuclear Power Station Unit 3
Multiple Turbine-Driven Auxiliary Feedwater (TDAFW) Pump failures from May 2013 to January 23, 2014

Background:

On May 15, 2013, at the end of the refueling outage, Dominion observed that the Millstone Unit 3 turbine-driven auxiliary feedwater (TDAFW) pump was experiencing speed oscillations of approximately ± 100 rpm (or approximately ±5% of average speed) when operating in low flow conditions following a full-flow surveillance test. The pump speed oscillated within 2.8% of the overspeed trip setpoint at 4746 rpm. The speed oscillations caused swings in the discharge pressure of ±105 psig (approximately ±10% of average discharge pressure) which approached within 1.1% of the discharge relief valve setpoint. These oscillations are both within the 3% setpoint tolerances for the respective devices. After troubleshooting and several adjustments to the turbine speed control governor, the pump did not achieve the required differential pressure during a second full flow test on May 17. Dominion subsequently determined that the oscillations did not reduce pump reliability and attributed the full-flow low differential pressure to the instability of the governor. Dominion concluded that TDAFW pump differential pressure remained above the design requirements specified in the accident analysis and determined the pump was operable.

A reactor trip occurred at Unit 3 on August 9, 2013. The TDAFW pump governor linkage was observed to be misaligned, and the pump was noted to be oscillating when operating at low flow rates. Discharge pressure exceeded the discharge relief valve lift setpoint (1850 psig) and fluctuated between 1869 psig and 1609 psig. In addition, speed fluctuated between 4656 rpm and 4350 rpm with the overspeed trip setpoint set at 4746 ±142 rpm. The system engineer requested that the pump be shut down when it was no longer required (after approximately four hours of operation) to facilitate troubleshooting. The shift manager stopped the TDAFW pump, declared the pump inoperable, and entered Technical Specification 3.7.2.1 on August 10. Troubleshooting revealed that the governor control linkage was out of adjustment (cam plate misaligned to the cam follower) and the governor compensator was not set correctly. Operation of the TDAFW pump in low flow conditions with an unstable governor could challenge the lift setpoint of the discharge relief valve and result in its opening. Excessive TDAFW pump speed oscillations were believed to challenge the overspeed trip feature of the TDAFW pump and could result in tripping the TDAFW pump when it is needed. On August 12, Millstone adjusted the governor compensator to eliminate the oscillations but that adjustment made the governor less responsive (more sluggish). They also corrected the problems identified above with the governor linkage.

Subsequently, on November 4, 2013, during routine quarterly surveillance testing of TDAFW system, the TDAFW pump tripped on overspeed shortly after the pump starting. At that time, Dominion believed the cause was water intrusion into the pump via condensate in the steam supply lines. An increased monitoring and surveillance plan was developed. Dominion then began running surveillance runs weekly to demonstrate continued operability of the pump. On December 18, 2013, they experienced another overspeed trip when the 'D' steam line was unisolated following repairs to a steam leak. Dominion attributed the overspeed trip to condensate in the 'D' steam line. With regards to water intrusion, the licensee implemented a number of compensatory measures and ran a number of surveillance tests to demonstrate operability.

On January 23, 2014, during the weekly surveillance run of the TDAFW pump, it again tripped on overspeed. Dominion did not attribute this trip to water intrusion as the cause because they implemented corrective actions to prohibit condensate intrusion into the pump following the two trips above. Dominion identified, during subsequent troubleshooting, that a key link in the governor control linkage had been installed incorrectly and was mechanically binding, thus preventing the governor from establishing proper control of the turbine during a start sequence. In addition, Dominion identified that the thrust output from the governor module was ~ 70 lbf, whereas a value of 300 lbf was expected. Following the granting of a Notice of Enforcement Discretion (NOED) to complete repairs on January 26, 2014, the TDAFW pump was returned to service and declared operable at 0505 on January 27, 2014.

Dominion is currently completing a root cause evaluation and the resident inspectors continue to conduct baseline inspections with assistance from Division of Reactor Safety specialists. Additionally, Millstone has launched a Focus team tasked to review the past ten years of operational practice, preventive maintenance, industry experience, and other information for the TDAFW pump.

Basis for the Formation of the Special Inspection Team:

The failure of the TDAFW pump involved a failure of safety-related equipment. There have been equipment and performance issues related to this pump dating back to the conclusion of the outage in May 2013. Additionally, in the 3rd Quarter Resident Inspection Report of 2013, there is a finding that involves an inadequate operability determination related to governor performance on this pump.

Using the Millstone Unit 3 Standardized Plant Analysis Risk (SPAR) model, the Region I Senior Reactor Analyst (SRA) calculated the conditional core damage probability (CCDP) for the TDAFW pump overspeed trip failures and associated unavailability times. Based upon best available information and a review of the known problems with the TDAFW pump since August 2013, the SRA made the following conservative assumptions to estimate the risk associated with the unreliability and unavailability of the pump: 1) the exposure time of the problems involving the turbine-driven pump date back to restart of the unit on August 12, 2013, and includes approximately 4,000 hours; 2) during surveillance testing conducted between November 4, 2013, and January 12, 2014, the TDAFW pump failed on demand (due to overspeed) 3 times out of approximately 9 starts; this 0.33 failure probability is used rather than the nominal 0.0649 value, to reflect actual failure to start probability for the exposure period; and 3) conservatively, no operator recovery credit following an overspeed trip failure was assigned. The SRA used the zero Test & Maintenance model for this risk assessment, in accordance with established guidance.

The calculated CCDP is: 1.52E-6.

If an operator recovery credit was to be assigned of a 1 in 10 chance of failure; the estimated revised CCDP would be 1.52E-6 X 1/10 = 1.52E-7. If the external event contribution were to be added, due to the importance of the TDAFW pump for fire mitigation, preliminary values obtained from the licensee would result in the CCDP increasing to the middle of the E-6 range.

Based upon best available information and the uncertainty of assigning a recovery credit because of the unknown TDAFW pump failure mechanism(s), the 1.52E-6 CCDP value was selected to represent the estimated risk increase associated with the Inspection Manual Chapter

(IMC) 0309 reactive inspection assessment. This CCDP value places the risk in the "No Additional Inspection" to "Special Inspection Team" overlap region.

Based upon the preliminary CCDP estimate of low E-6 range, in accordance with IMC 0309, this event falls within the range for a Special Inspection Team.

Objectives of the Special Inspection:

The objectives of the special inspection are to review and assess: (1) Dominion's planning and execution of the risk significant work activities on the TDAFW system; (2) equipment issues related to the TDAFW testing; and (3) Dominion's response to this significant equipment failure.

To accomplish these objectives, the following will be performed:

1. Review whether there should be any enforcement action associated with the granting of the NOED.

2. Generate a timeline of events which captures the failures, maintenance evolutions, and tests performed on the TDAFW system.

3. Evaluate the adequacy and completeness of the maintenance on the TDAFW system, including preventive maintenance, maintenance practices, procedural guidance, post-maintenance testing, and supervisory oversight.

4. Evaluate Dominion's application of pertinent industry operating experience and evaluation of potential precursors including the adequacy of any actions taken in response to the operating experience or precursors.

5. Evaluate the adequacy of Dominion's response to the TDAFW system failures, including Dominion's cause analyses, extent of condition, corrective actions, and failure mode considerations.

6. Verify the licensee met the proper reporting requirements of 10 CFR 50.72 and 10 CFR 50.73. Also determine if the licensee has plans to issue a Licensee Event Report to document this issue.

7. Evaluate the adequacy of Dominion's past operability with regards to the TDAFW system.

8. Evaluate Dominion's assessment of the risk significance of the degraded condition, including evaluation of input assumptions and independently evaluate the risk significance.

9. Evaluate the adequacy of Dominion's final root cause for the TDAFW system failures. (Approximate completion date March 2014)

Additionally, the team leader will review lessons learned from the Special Inspection and, if appropriate, prepare a feedback form on recommendations for revising the Reactor Oversight Process baseline inspection procedures in order to proactively identify the issues and causes involved with the event.

Guidance:

Inspection Procedure 93812, "Special Inspection," provides additional guidance to be used by the Special Inspection Team. Team duties will be as described in Inspection Procedure 93812. The inspection should emphasize fact-finding in its review of the circumstances surrounding the event. It is not the responsibility of the team to examine the regulatory process. Safety concerns identified that are not directly related to the event should be reported to the Region I office for appropriate action.

The Team will conduct an entrance meeting and begin the initial onsite inspection on February 3, 2014. While on site, the Team Leader will provide daily briefings to Region I management, who will coordinate with the Office of Nuclear Reactor Regulation, to ensure that all other parties are kept informed. Additional inspection activities will continue through completion of Dominion's final root cause analysis. The inspection is anticipated to complete in March 2014. A report documenting the results of the inspection should be issued within 45 days of the completion of the inspection. This Charter may be modified should the team develop significant new information that warrants review.

Millstone Unit 3 TDAFW Timeline

5/12/13	During 3R15, WO 53102204245 installs Seal Master cam roller, overhauls control valve, inspects inner/outer packing gland areas, and replaces stem spacers/washers
5/15/13	Maintenance run and full flow operational test (SP3622.3-005)
5/17/13	Operational readiness/quarterly IST test (SP 3622.3)
8/9/13	Automatic start on Reactor trip
8/10/13	System engineer finds governor valve linkage out of alignment.
8/11/13	Cam follower replaced, thread-locker applied to cam roller nut, governor tuned. Maintenance run and Operational readiness test (SP 3622.3)
8/12/13	Maintenance run and full flow test (SP 3622.3)
8/26/13	TDAFW Time Response test (SP 3622.3)
11/4/13	TDAFW overspeed trip during Operational readiness/quarterly IST test (SP3622.3)
11/5/13	Fast start for troubleshooting and an Operational readiness test (SP 3622.3), not an operability run
11/6/13	Operational readiness test (SP 3622.3)
11/12/13	Operational readiness test (SP 3622.3)
11/16/13	Operational readiness test (SP 3622.3)
11/18/13	Operational readiness test (SP 3622.3)
12/2/13	Operational readiness test (SP 3622.3)
12/18/13	TDAFW overspeed trip during operational readiness test (SP 3622.3). Operational readiness test (SP 3622.3) for information only, not operability
12/19/13	After pump linkage pull test, Operational readiness test (SP 3622.3)
12/20/13	Two operational readiness tests, second one for operability (SP 3622.3)
12/26/13	Operational readiness test (SP 3622.3)

1/2/14	Operational readiness test (SP 3622.3)
1/10/14	Operational readiness test (SP 3622.3)
1/16/14	Operational readiness test (SP 3622.3)
1/23/14	TDAFW overspeed trip during operational readiness test (SP 3622.3)
1/26/14	Dominion requests NOED for Millstone 3. Governor replaced, Heim joint orientation corrected, cam follower bearing replaced. Maintenance run, SP3622.9, and full flow tests.
1/27/14	Operational readiness test with single steam supply line (SP 3622.3)
1/29/14	CR 538353 identifies unexpected wear and oxidation observed on removed cam follower bearing on both 8/11/13 and 1/26/14.
1/30/14	CR 538743 identifies TDAFW has the incorrect cam follower bearing
2/3/14	Dominion takes TDAFW out of service, replaces cam follower with correct part. SIT inspectors observe disassembly/reassembly maintenance.
2/4/14	Maintenance run and surveillance (SP 3622.3) as post-maintenance test.

Detailed Risk Significance Evaluation

Initial Screening

The failure to identify and correct the installation of an incorrect cam follower bearing in the turbine governor control valve linkage to the turbine-driven auxiliary feedwater (TDAFW) pump, a condition adverse to quality, was more than minor and a performance deficiency (PD). This finding was screened for safety significance using IMC 0609, "Significance Determination Process," Appendix A, Exhibit 2, "Mitigating Systems Screening Question," and determined to require a detailed risk evaluation because the automatic start function of the TDAFW pump was determined to be either failed or unreliable for greater than the Technical Specification allowed outage time. Specifically, in the time period of August 11, 2013 to February 3, 2014, the incorrect cam follower bearing contributed to three turbine overspeed trips and a number pump output flow oscillation problems adversely impacting the reliability and dependability of the pump.

Detailed Risk Evaluation

The Senior Reactor Analyst (SRA) used the Systems Analysis Programs for Hands-On Evaluation (SAPHIRE) Revision 8.1.0 and the Standardized Plant Analysis Risk (SPAR) Model for Millstone Unit 3, Model Version 8.20, to conduct the internal events detailed risk evaluation and the licensee's Individual Plant Examination (IPE) for Severe Accident Vulnerabilities and the Individual Plant Evaluation External Events (IPEEE) to assess the external events risk contribution for this performance deficiency.

Internal Events Contribution

The SRA used the below table to summarize the condition of the TDAFW pump between the period of May 2013 and February 2014, when the incorrect Seal Master roller bearing was installed. The total number of credited demands (cold start surveillance tests using SP3622.3-005, "TDAFW Full Flow Operational Test," and one automatic start on August 9, 2014) and failures (turbine trip on overspeed) during the time period the incorrect cam follower bearing was installed was three failures in 25 total demands. The SRA used the failure probability of 3/25 or 0.12 to accurately represent the reliability of the TDAFW pump while the incorrect bearing was installed. While the exposure period for the incorrect bearing installation is approximately 259 days, the team identified the performance deficiency for the period between August 11, 2013 and February 3, 2014 (173 days). The August 11, 2013 date represents the first opportunity that Dominion had to have identified the incorrect bearing installation and February 3, 2014 represents the day the bearing was replaced with the correct bearing, resolving the adverse condition to quality.

Date(s)	Failure/Demand	Exposure Period	Notes:
05/15-17/13	0/3	86 days	3 steam lines in service; 05/15 new incorrect Sealmaster bearing installed; 08/09 auto start on reactor trip and pump shutdown after 4 hours operating due to flow oscillations
08/09/13	0/1		
08/11/13	0/2		
08/12-26/13	0/1 (new incorrect bearing installed)	14 days	
08/26/13	0/1	<1 day	1 steam line (B) in service
08/26-11/04/13	1/1 (overspeed trip)	70 days	3 steam lines in service, no starts other than 11/04 quarterly ST
11/05-06/13	0/1	42 days	2 steam lines in service (D isolated)
11/12/13	0/1		
11/16/13	0/1		
11/18/13	0/1		
12/02-18/13	0/1		
12/18/13	1/1 (overspeed trip)	<1 day	3 steam lines in service
12/18-20/13	0/3	35 days	2 steam lines in service: on 01/26 - Heim joint R2 properly installed, governor replaced, valve set-up corrected
12/26/13	0/1		
01/02/14	0/1		
01/10/14	0/1		
01/16/14	0/1		
01/23/14	1/1 (overspeed trip)	11 days	
01/26/14	0/1		
01/27/14	0/1		
02/03/14	Correct Heim bearing installed		

The SRA made the following changes to the Millstone Unit 3 SPAR model:

- Turbine Driven Feed Pump P2 failure to start (AFW-TDP-FS-P2) basic event nominal failure probability (6.5E-3) was changed to reflect the failure rate (overspeed trips per demands) during the time the incorrect roller bearing was installed, equal to 0.12
- Exposure time for the condition case was set at 173 days

Based upon these changes to the model, the calculated conditional or delta core damage frequency (CDF) is 2.75E-6 (conditional case) minus 1.93E-6 (base case) equal to 8.2E-7/year.

Internal Events Recovery Credit

The Millstone 3 SPAR model does not include an operator action recovery probability for the TDAFW pump. To estimate a recovery probability, the SRA confirmed that Unit 3 Emergency Operating Procedures (EOPs) address operator actions to establish or recover the TDAFWP (refer to EOP 35 FR-H.1, "Response to Loss of Secondary heat sink,") as directed by E-0, "Reactor Trip or Safety injection". The team identified that between December 18, 2013 and January 30, 2014, Dominion revised EOP 35 FR-H.1 four times to enhance operator guidance and to improve the likelihood of a successful restart of the turbine. Based upon Dominion's identified direct cause of the three TDAFW pump overspeed trip events and the absence of any actual attempts by operators to recover the TDAFW pump following these trip events, the SRA concluded that recovery credit was more dependent upon the mechanistic failure of the turbine control system than the success of operators to implement recovery actions in a timely manner. Accordingly, the SRA assumed the recovery probability was the same as the failure probability for the exposure period.

The SRA considered the range of possible recovery credit from between zero, or no recovery credit, to no less than 0.01, using a SPAR-H human reliability analysis approach with nominal performance shaping factors. Based upon the team's review of the videotapes of the observed turbine overspeed trips, in all cases the governor valve control linkage did not move until the turbine tripped. This indicated that the control linkage was either bound (presumably due to the frictional forces caused by the incorrect roller bearing) or the combination of the resistive forces applied by steam admission to the turbine (valve stem load), incorrect bearing frictional forces and linkage resistance were greater than the output of the governor attempting to drive the control valve to the closed position. An argument can be made that following the turbine trip and closure of the control valve, the linkage and any associated binding has been exercised and free to move on a subsequent demand. This situation would support assigning recovery credit commensurate with nominal human failure probabilities. Likewise, an argument can be made that the same binding or cumulative resistive forces remain and could cause the control valve linkage to bind again on a subsequent restart attempt. In this case, it would be appropriate to assign zero recovery credit, because the failure mechanism(s) has not been cleared or corrected. As stated above, absent conclusive evidence, the team believes the most appropriate and reasonable recovery credit is assumed to be no better or worse than the failure probability derived from the demands and failures observed during the exposure period associated with the incorrect bearing installed.

Using the above calculated delta CDF value and the approximate recovery probability, the SRA calculated the total internal risk contribution for this PD to be 8.2E-7 x 0.12 = 9.8E-8/year. , Although this calculated delta CDF value is less than 1E-7, based upon the importance of the TDAFW pump to fire scenario mitigation, per IMC 0609, Appendix A, Section 6.0, "Detailed Evaluations," it is appropriate to evaluate this PD for risk associated with external events. Per IMC 0609, Appendix H, a review of this PD for potential impact on Large Early Release Frequency (LERF) identified that none of the dominant internal event core damage sequences involve steam generator tube rupture; and therefore screen this issue from further review for LERF considerations.

The dominant core damage sequences include initiating events involving loss of either DC bus, loss of offsite power or transients, with subsequent loss of normal and auxiliary feedwater and failure to cool the primary via feed and bleed.

External Events Contribution

To evaluate the external events contribution for this performance deficiency, the SRA reviewed the Millstone Unit 3 Individual Plant Examination (IPE) for Severe Accident Vulnerabilities, dated August 1990 and the Individual Plant Examination External Events (IPEEE), dated September 1992. Millstone Unit 3 does not have a fire PRA. From the IPE and IPEEE, the SRA determined that the importance of the TDAFW pump in mitigation of fire events is significantly higher than seismic and other external event hazards (i.e., tornadoes, high winds, external flooding, transportation, and plane crashes) based upon the TDAFW pump being a protected (from fire) single train system. Consequently, the external event risk contributions to events other than fire were not considered. In addition, the SRA reviewed external event notebooks developed by the NRC for similar four-loop pressurized water reactors to gain risk insights and appropriate fire scenario modeling examples.

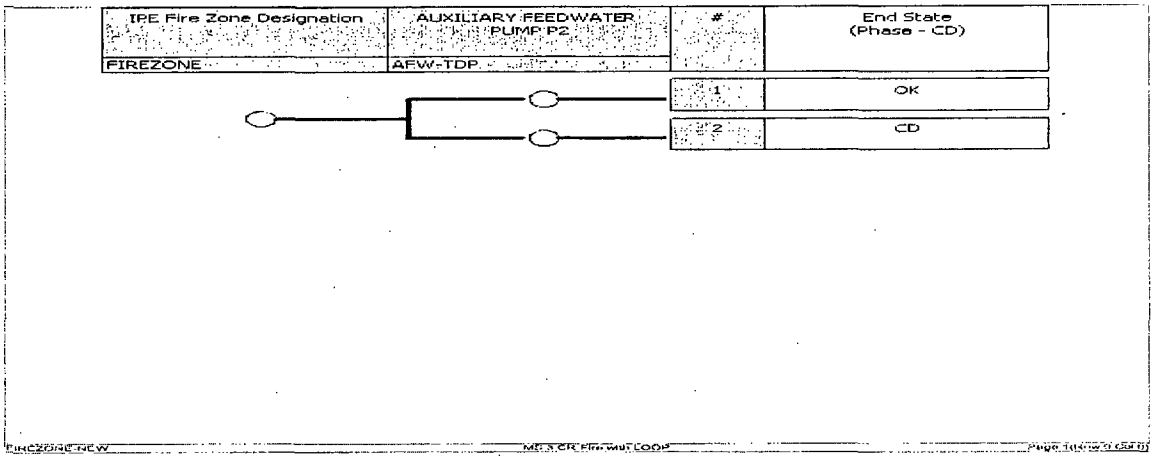
To approximate the delta CDF contribution for this PD, the SRA used the quantitative values derived from the IPE and IPEEE for fire zone core damage contribution, fire frequencies and severity factors associated with non-detection/suppression probabilities. IPE Table 3.5-5, "Mean Frequency – Fire Areas versus Plant Damage States," identifies, by fire zones, the approximate annualized contributions to total fire CDF (4.8E-6/year) assuming the complete loss of the fire zone due to a postulated fire. The fire zones of interest that have auxiliary feedwater (AFW) system dependencies are: Control Room (Zone CB-9); Instrument Rack Rooms (CB11-A and 11B); Cable Spreading Room (CB-8) and the Charging and CCP Zone (AB-1). These four zones account for approximately 60 percent of the annualized fire risk (or 3.03E-6/year). The SRA also used IPE Table 3.5-4, "Fire Initiating Event Frequencies," to obtain specific fire frequencies, by fire zone, and the associated approximate severity factors.

In the event of a fire in any of the above affected fire zones, operators would evaluate control room abandonment and potentially implement remote shutdown strategies per the guidance in EOP 3509.1 (Control Room, Cable Spreading Area or Instrument Rack Room Fire) or EOP 3509.2 (Auxiliary Building Fire). Important to note is that, upon entry into either of these procedures for a fire, both EOP 3509.1 and 3509.2 prohibit entry into EOP E-0, "Reactor Trip or Safety Injection." Consequently, should the TDAFWP fail to automatically start or run, there is no direct procedural guidance to attempt recovery of the pump via these two procedures, unlike the procedural guidance in E-0, as discussed above. Also, the SRA identified that Millstone Unit 3 does not credit primary feed and bleed in the control room abandonment fire mitigation strategies. Per IMC 0609 guidance and the Risk Assessment of Operational Events (RASP) Handbook, Volume 1,"Internal Events," Section 6, without procedural guidance, operator recovery credit is generally not allowed in the risk assessment. Likewise, NUREG-1921, "EPRI/NRC-RES Fire Human reliability Analysis Guidelines," Section 4.6.3, Procedures and Training, states that: "If any fire response actions are required that are not proceduralized, the

fire HRA should not take credit for them as a first approximation. Non-proceduralized recovery actions are to be credited on an as-needed basis." The SRA notes that subsequent to the problems associated with the TDAFW pump, Dominion did revise the procedural guidance in EOP 3509.1 and 3509.2 to include TDAFW pump recovery action steps.

Closer examination of the four fire zones of interest and the associated fire response procedures identified that for the Charging and CCP Zone AB-1 fires, the motor-driven AFW pumps remain available and are credited in EOP 3509.2. Discussions with the Dominion Risk Analyst identified that the Cable Spreading Room Zone CB-8 fire contribution calculated in the IPE (surrogate 1990) does not credit the subsequent (2002) installation of an incipient fire detection system (IDS). The IDS detectors are installed in the cable trays (vice general area) to ensure prompt detection. The IDS was installed to address an unreliable automatic carbon dioxide suppression system that had to be placed in manual mode to prevent inadvertent actuations. In addition, Dominion believes that appropriate transient combustible controls minimize any fire ignition risk in this zone. Accordingly, the IPE Zone CB-8 fire frequency and estimated fire risk contribution may be overly conservative. Based upon NUREG/CR 6850, Supplement 1, early fire detection provided by an IDS may be applied for fire risk reduction. Along with the early actions of the fire brigade to suppress a fire or de-energize a degrading ignition source prior to that detected fire damaging surrounding equipment, IDS fire protection credit or a reduction factor of 0.5 is reasonable and has been previously accepted by the NRC staff for similar circumstances. To address the potential conservatisms in the documented Zone CB-8 fire risk contribution. In July 2014, Dominion completed a detailed engineering evaluation of the ignition sources and associated targets, detection and suppression capabilities for the cable spreading room. Based upon this evaluation, the revised fire frequency (inclusive of the severity factors) was re-calculated to be 4.52E-5/year.

The SRA used a simplified event tree (see below) to represent the external fire risk per affected fire zone. As stated above, the fire frequencies were taken from IPE Table 3.5-4. The nominal TDAFWP fail to start (FTS) probability (6.49E-3) was taken from the Millstone 3 SPAR Model. The individual fire zone contributions are summarized in the following table.



Fire Zone	Fire Frequency	Nominal Case (FTS = 6.49E-3)	Condition Case (FTS = 0.12)	Delta CDF
CB-9	4.48E-4/year	2.91E-6	5.38E-5	5.09E-5
CB11A and 11B	1.50E-4/year	9.74E-7	1.8E-5	1.70E-5
CB-8	4.52E-5/year	2.93E-7	5.42E-6	5.13E-6
			Total	7.30E-5

To account for the exposure period of 173 days, the total fire zone contribution value of 7.30E-5/year is multiplied by 173/365 or 0.474 to calculate the external event delta CDF value of 3.46E-5/year.

Per the qualitative screening criteria in NUREG-1921, Section 4, Table 5-1, the SRA used a 0.1 human error probability (HEP) to estimate an operator recovery credit. As stated above, operator recovery credit may be allowed on a case-by-case basis. The SRA determined that although EOP 3509.1 did not include recovery steps, operators would have had sufficient cues (identified the lack of auxiliary feedwater flow and/or the TDAFW pump tripped) per the control room abandonment procedure and had sufficient time to take action to restart the TDAFW pump prior to steam generator dryout. The SRA calculated the recovery credit by adding the operator HEP estimate to the conditional TDAFW pump FTS probability (0.1 + 0.12 = 0.22) because the cause of the mechanistic failure was not identified or corrected, and may still compromise operator recovery actions. Multiplying the external event delta CDF by the assumed recovery credit (3.46-5/year x 0.22 = 7.6E-6/year) yields a White (low to moderate risk significance) contribution.

The risk insight associated with the relatively high external events (fire) risk significance of the TDAFW pump is that the Millstone Unit 3 control room evacuation procedure relies upon a single make-up source to the steam generators to provide secondary cooling, and thereby decay heat removal. Upon control room abandonment (due to fire), all subsequent mitigation actions and recovery efforts are procedurally driven per EOP 3509.1 and this procedure does not include primary feed and bleed as an alternative core cooling method.

Overall Risk Significance

The total change in CDF associated with the reduction in TDAFW pump reliability for the period between August 2013 and January 2014 is the sum of internal and external conditional core damage frequencies (9.8E-8 + 7.6E-6 = 7.7E-6), which is of preliminary White, or low to moderate overall safety significance. This finding should be characterized as preliminary White in the special inspection team inspection report

Dominion PRA Staff Risk Insights and Considerations (summarized, to date)

Discussions with the Millstone PRA staff identified a few risk insights and assumptions that may significantly influence the external events conditional core damage frequency contributions. Specifically:

- As stated above, Dominion believes that the values in IPE Table 3.5-4 and Table 3.5-5 associated with fire frequencies, severity factors and associated fire zone contributions are overly conservative. Dominion recently (July 2014) completed a re-evaluation and determined the fire frequency and associated severity factor for the Cable Spreading Room (CB-8) is 4.52E-5/year. This value includes credit of the installed IDS.
- Dominion believes that the conditions warranting control room abandonment would be carefully and judiciously considered (fire, smoke, hot gases or fumes, CO_2) by the control room operators and be exercised as a last resort before being limited by the single mitigation strategy outlined in EOP 3509.1. This would potentially provide control room operators a broader selection of mitigation systems and available strategies to ensure adequate core cooling is maintained. Based upon the postulated control room abandonment scenarios, Dominion believes the two motor-driven AFW pumps would operate for some time, providing additional time/margin to steam generator dryout conditions.
- A recent thermal-hydraulic analysis of the available time to steam generator dryout following a reactor trip (with total loss of feedwater) with steam generator levels initially within the normal operating range identified approximately 1.9 hours before steam generator dryout (time available for feedwater recovery actions).
- Dominion used the estimated 1.9 hours to steam generator dryout and the guidance in NUREG-1921 to estimate an operator recovery credit for restoration of the TDAFW pump. Dominion estimated the human error probability to be 3.5E-2. In conjunction with the conditional FTS probability, the TDAFW pump recovery probability was estimated at 0.155.

The Dominion PRA staff believes that the risk significance of the performance deficiency associated with the TDAFW pump is in the mid-White range.

From: Finney, Patrick
To: Arner, Frank; Chambers, Michael; Cook, William
Cc: McKinley, Raymond; Ambrosini, Josephine
Subject: MS3 - SIT - Loctite item
Date: Thursday, June 12, 2014 7:14:41 PM

Information to consider from material I have:

- 8/10/13 00:56 TDAFW tripped, restored to auto control (per MRE 016681, manually tripped, governor rack pos'n reset by admitting steam)
- 8/10/13 12:45 log entry that AFW Sys Eng notifies Ctrl Rm that linkage bushing backed out of position, inop
- 8/10/13 13:21 CR 522896 – Sys Eng w/d id's cam follower misalignment, spd oscillations during operation, RV45 lifted, (traces attached to CR), L3 ACE
    - CA267166 Rework assignment to mntnce, Instructional deficiency – "Terry Turbine Linkage retaining nut vibrated loose. Locking material has been added to prevent a recurrence, reference work order 53102656351. This is rework due to lack of instruction in the procedure to apply locking material. A procedure change has been initiated."
    - MRE016681 – "Misalignment of control valve to governor linkage is a degraded condition where no failure occurred. There is reasonable assurance that the 'Cam Follower' remained capable of transferring the cam profile motion from the Cam Plate to the control valve (CV5) valve stem. Visual inspection confirmed the Cam Follower remained partially engaged in the Cam Slot of the Cam Plate (detail of linkage assembly is attached). There was no binding of Cam Follower, Washer, or Lock Nut configuration. The Lock Nut was up against Fulcrum Support so that Cam Follower was unable to become fully disengaged from Cam Slot. This determination was confirmed by Terry Turbine vendor contact Mr. Edward Grandusky (Principle Engineer for Dresser-Rand). Ed reviewed the partial Cam Follower engagement condition and confirmed that there is a high confidence that the Terry Turbine remained fully capable of performing as designed."
- 8/11/13 15:49 CR 522932 – after rpr of linkage, mntnce run, 35 min into run oscillations, exceeded RV45 setpt
- 8/12/13 18:04 CR 523006 – RV45 lift 2X during transition from full to recirc flow

Pat Finney
Salem SRI
856-935-3850

A/13

From: Arner, Frank
To: Haagensen, Brian
Subject: RE: Scan from Millstone HP5035
Date: Thursday, July 24, 2014 12:32:48 PM

Thanks Brian

-----Original Message-----
From: Haagensen, Brian
Sent: Thursday, July 24, 2014 10:35 AM
To: Finney, Patrick; Arner, Frank; Cook, William; Chambers, Michael
Cc: McKinley, Raymond; Shaffer, Steve; Ambrosini, Josephine; DeBoer, Joseph; Day, Neil
Subject: FW: Scan from Millstone HP5035

Pat, Frank, Bill, Mike,

Attached is the Millstone CR that was recently drafted (7/21 by licensing - not maintenance) to address the issue with the PD on the maintenance procedure that installed the cam follower bearing capture nut. FYI. We shall follow corrective actions for this CR/NCV.

Brian

-----Original Message-----
From: R1Scan [mailto:R1Scan@nrc.gov]
Sent: Wednesday, July 23, 2014 4:44 PM
To: Haagensen, Brian
Subject: Scan from Millstone HP5035

Please open the attached document. This document was digitally sent to you using an HP Digital Sending device.

From: Finney, Patrick
To: Haagensen, Brian
Subject: RE: Scan from Millstone HP5035
Date: Thursday, July 24, 2014 10:37:16 AM

Thanks Brian.

From: Ambrosini, Josephine
To: Haagensen, Brian; Finney, Patrick
Subject: RE: MS3 - CR?
Date: Monday, August 11, 2014 9:30:42 AM

I talked to licensing. They are going to check out a few things (1) what, if anything, did Dominion do with this IN at the time of its issuance and (2) determine whether our characterization of the issue requires further analysis on their part (i.e. a CR).

We'll bring it up with Cleary tomorrow at our routine meeting and see where they're heading. I mean, they don't *have* to do anything in response to an IN, but it appears to have been pretty relevant to the challenges they experienced and I'm surprised the root cause didn't see it that way.

From: Haagensen, Brian
Sent: Monday, August 11, 2014 7:55 AM
To: Finney, Patrick
Cc: Ambrosini, Josephine
Subject: RE: MS3 - CR?

I think we have exhausted our ability to find the IN on our own. Next step is to ask Dominion for the "official answer" and that's up to Jo at this point.

Brian

From: Finney, Patrick
Sent: Monday, August 11, 2014 7:53 AM
To: Haagensen, Brian
Cc: Ambrosini, Josephine
Subject: RE: MS3 - CR?

Brian,
Thanks for the look. Didn't want to duplicate efforts but Jo was looking at this also.

The real crux for me is: assuming my assessment stays in the report, it is the only assessment paragraph without an accompanying CR entry.

From: Ambrosini, Josephine
To: Finney, Patrick; Haagensen, Brian
Subject: RE: MS3 - CR?
Date: Monday, August 11, 2014 7:20:12 AM

I don't recall seeing one, but most of the spring/summer is a blur. Let me find out and get back to you.

From: Finney, Patrick
Sent: Friday, August 08, 2014 2:21 PM
To: Ambrosini, Josephine; Haagensen, Brian
Subject: MS3 - CR?

MS Residents,
Did Dominion generate a CR for this feedback we gave? I do not have any record of such. If not, can we ask them why?

The inspectors determined that while Dominion had considered pertinent industry and internal operating experience, Dominion had not properly evaluated NRC Information Notice (IN) 2010-020, "Turbine-Driven Auxiliary Feedwater Pump Repetitive Failures." IN 2010-020 states, in part, that the operating experience examples discussed "illustrate the importance of ensuring that any condition adverse to quality affecting the TDAFW system is fully understood so that appropriate corrective actions can be taken. Repetitive failures... may indicate that although the direct cause of the original condition was addressed, the root cause remains uncorrected." Inspectors determined there were no CAP entries regarding IN 2010-020 and there was nothing in the TDAFW system health report related to the IN. Dominion's RCA for this issue concluded that the events described in IN 2010-020 "were not specifically applicable to the Unit 3 TDAFW pump overspeed trips." Based on Dominion's failure to identify and fully understand the cause of the overspeed trips, the inspectors determined that the IN 2010-020 discussion was pertinent to the Millstone 3 TDAFW condition. The inspectors concluded this issue was not more than minor in accordance with IMC 0612[PWF1] .

Pat Finney
TSAB BC (Acting)
610-337-6959

CR?

McKinley, Raymond

From: Finney, Patrick
Sent: Tuesday, August 26, 2014 11:41 AM
To: Pinkham, Laurie; McKenzie, Kieta; Thompson, Margaret
Cc: McKinley, Raymond; Finney, Patrick
Subject: Millstone 3 - SIT #1 - Insp Rpt ready for final
Attachments: MillstoneIR1408_RevE.docx

DRP OAs,
Not sure who may be in today. The subject report is ready for final print and Ho's review/signature. Please print from the link below, replace the hard copy in concurrence in Kieta's inbox, and route to Ho for final review/signature. Any issues, let me know. Thanks.

G:\DRP\BRANCH5\Reports\Drafts\2014\MillstoneIR1408_RevE.docx

Pat Finney
Salem SRI
856-935-3850

A/16

Cook, William

From: Haagensen, Brian
Sent: Thursday, August 28, 2014 10:34 AM
To: McKinley, Raymond; Shaffer, Steve; DeBoer, Joseph
Cc: Ambrosini, Josephine; Finney, Patrick; Arner, Frank; Cook, William; Chambers, Michael
Subject: Millstone Station D-15 announcing the SIT results

Ray,

Below is the D-15 that was just released to all station personnel announcing that the SIT reports would be made public today. Once again, they continue to blame all the problems on the incorrect bearing that was installed – see my highlighted yellow text below.

They continue to blame the TDAFW pump problems on the incorrect bearing as the root cause. The subtext here is that they could not have possibly discovered until the vendor figured it out and released the part 21. After all, they ordered the "correct part" which was a "like for like replacement". It really was not their fault even though we may hold them responsible.

Perhaps they will get a better idea of our characterization of their performance when the read the actual report. I believe we make it clear that the incorrect bearing was only a small part of a much larger problem.

I am now done pontificating....

Brian

From: Brian C Haagensen (Generation - 6) [mailto:brian.c.haagensen@[redacted]]
Sent: Thursday, August 28, 2014 10:22 AM
To: Haagensen, Brian
Subject: D-15

NRC Special Inspection Team (SIT) Report Released

The NRC is releasing the reports from its two Special Inspection Teams (SIT) tomorrow. One SIT focused on the May 25 loss of offsite power event and the other was focused on the Unit 3 turbinedriven auxiliary feedwater pump's (TDAFW) performance. As a result, the team identified five findings - three for the loss of offsite power event and two for the Unit 3 TDAFW. The following are the preliminary findings indentified during the SIT exits. Findings identified for the loss of offsite power event are:

- A Green Non-Cited Violation (NCV) for failure to transition through emergency operating procedures (EOP) in a timely manner at Unit 3
- A Green finding for inadequate implementation of the design change process used to remove the Severe Line Outage Detection (SLOD) system. The NRC feels that the "Failure Modes and Effects Analysis" was not performed correctly and that the design change did not recognize that SLOD is credited in the FSAR for both units for General Design Criteria 17 compliance.
- A violation, severity level III using traditional enforcement, for Dominion's failure to obtain a License Amendment for the SLOD design change before the equipment was removed

Findings related to the Unit 3 TDAFW are:

- A Green NCV for inadequate procedures for reassembling the TDAFW governor valve control linkage
- A White violation for not identifying that the incorrect spherical bearing had been installed in

A/17

the TDAFW sooner. While it was ultimately identified in January 2014, there were opportunities to identify it beginning in August 2013.
The above items have been entered into the corrective action system.

Brian Haagensen
USNRC Resident Inspector
Millstone Nuclear Station
860-444-5777

Cook, William

From: McKinley, Raymond
Sent: Monday, September 08, 2014 4:09 PM
To: Dean, Bill; Lew, David; Nieh, Ho; Scott, Michael; Trapp, James; Welling, Blake; Jackson, Donald; Bickett, Brice; McLaughlin, Marjorie; Crisden, Cherie; Finney, Patrick; Cataldo, Paul
Cc: Ambrosini, Josephine; Haagensen, Brian; McKown, Louis; Shaffer, Steve; DeBoer, Joseph; Cook, William; Schmidt, Wayne
Subject: Millstone SIT Preliminary Enforcement Actions - Licensee Verbal Response to Choice Letters

All,

I have received a verbal response from Millstone for the escalated enforcement actions related to the TDAFP SIT (SIT 1) and the LOOP SIT (SIT 2).

TDAFP SIT: Preliminary White

The licensee has elected to accept the White Finding and associated violation as characterized in the report. So, we are clear to proceed with rendering a final significance determination.

LOOP SIT: SL III 50.59 Violation

The licensee has elected to respond in writing. They may need an extension to the 30 day deadline, and I informed them that we would work with them if they needed additional time. I informed them that we could extend out to 45 days without too much trouble, but we could go out as long as 60 days under extenuating circumstances. They do not intend to contest the violation, but they are researching the GDC 17 compliance issue. They may make a case that they are currently in compliance with GDC 17, but they are not sure about that yet. Their corrective actions will depend on their conclusion, and it may also affect our final significance determination. They will let me know later this week if they think they will need an extension to the 30 day written response deadline.

Ray

Cook, William

From: Haagensen, Brian
Sent: Friday, August 01, 2014 9:08 AM
To: Finney, Patrick; Arner, Frank; Chambers, Michael; Cook, William
Cc: McKinley, Raymond; Shaffer, Steve; Ambrosini, Josephine; Day, Neil; Barber, Scott
Subject: FW: Technical Conscience CR for the TDAFW pump
Attachments: Scan File.pdf

Did the SIT review the viability / basis for Dominion's corrective actions to reduce the TDAFW pump speed from 4500 rpm to 4475 rpm? We need to know if the calc that translates the pump head requirement to the SP 3622.3 acceptance criteria is correct (i.,e. appropriate instrument error analysis). TS surveillance requirement in Unit 3 TS 4.7.1.2.1.b (pump can develop a total head of 3780 feet) does not include allowance for instrument measurement . They are in the process of submitting a LAR to change the surveillance requirement from the specified dynamic head to "in accordance with the IST program pump requirements" - the standard tech spec surveillance language for the TDAFW pump. This will move the surveillance requirement out of the tech specs and into Dominion's direct control.

I only need to know if you reviewed this change and if the reduced speed provides sufficient margin to meet the surveillance test requirement. If not, we will look at it for both the present condition and the pending design change/LAR.

Brian

-----Original Message-----
From: Haagensen, Brian
Sent: Monday, July 14, 2014 8:49 AM
To: Finney, Patrick; Arner, Frank; Cook, William; Chambers, Michael
Cc: McKinley, Raymond; Shaffer, Steve; DeBoer, Joseph; Ambrosini, Josephine; Day, Neil; McKown, Louis (Louis.McKown@nrc.gov)
Subject: Technical Conscience CR for the TDAFW pump

SIT Members,

Attached is a new CR from Engineering which essentially states that the comp measure established to maintain operability by reducing the high speed stop on the Unit 3 TDAFW pump was never needed. Engineering requests that they change the surveillance procedure to increase the TDAFW pump start speed back to the old value of 4500 rpm.

They further conclude that "The original wider operating band is desired to prevent the diversion of station resources due to a condition THAT HAS NO EFFECT ON SYSTEM FUNCTION OR OPERABILITY." (emphasis in CAPs added)

This change would effectively undo the comp measure established under OD000590 and represents a continued technical disagreement between engineering and plant Ops/management regarding the operability of the TDAFW pump. Engineering remains concerned that if they run the TDAFW pump at the lower speed setting (4425-4475 rpm - established as a comp measures) for the surveillance test (scheduled again for today) that the pump may not pass the test because of minimal margin at that speed setting.

We will carefully observe the final disposition of this CR and will observe the surveillance test.

In my opinion, Engineering has a valid concern. But the right answer is not to simply increase the speed back to the old high speed stop setting. Instead, they should consider resetting the high speed stop to the original

setting and relying on the operators to manually maintain TDAFW speed under low flow conditions such that it does not challenge the RV45 setpoint. This would require more procedural changes and operator training.

Brian

-----Original Message-----
From: R1Scan [mailto:R1Scan@nrc.gov]
Sent: Monday, July 14, 2014 8:35 AM
To: Haagensen, Brian
Subject: Scan from Millstone HP5035

Please open the attached document. This document was digitally sent to you using an HP Digital Sending device.

CR553412 Procedure Change to Remove Restricted TDAFW Operating Speed Band in SP3622.3

Applicable Unit: 3 **Discovery Method:** SEFI (Self Identified)

Submitter: SCOTT, DOUGLAS A **Dept:** MILL - Engineering - Site **Phone:** 3699

Discovery Date: 07/08/2014 **Time:** 16:00:00 **Work Order #(s):**

System(s): AFW--AUXILIARY FEEDWATER TDAFW

Equipment*: M33FWA*P2 [TURBINE DRIVEN AUXILIARY FEEDWATER PUMP] (1) { } [SR] (MUST START AND OPERATE TO PROVIDE FLUID FLOW) { }

Description:

During minor revision 21 of SP3622.3 a change was made to the required operating speed band of the TDAFW pump P2. This was not required by OD000590. The required operating speed remains unchanged as referenced by the IST program (see reference 6.6.7). Turbine speed of 4,465 to 4,485 rpm was the desired setting of the high speed stop and is in no way tied to an acceptance criterion of the surveillance. Summary of Changes 7.1.6 erroneously states this is required for OD000590.

During the last surveillance, the TDAFW pump met the more limiting operating band in the current version of the procedure. This requested change to the procedure has no impact on the pump's operability. The original wider operating band is desired to prevent the diversion of station resources due to a condition that has no affect on system function or operability.

Procedure change is recommended prior to the next TDAFW pump run to restore the operating speed band to 4,455 to 4,545rpm in steps: 4.1.27, 4.1.28, 4.6.10, 4.6.12, 4.6.14.b, 4.9.17.c

Associated with Boric Acid? No

Initial Actions:

Validated information in approved OD and alerted OPS procedures personnel of need for change. Confirmed this procedure change has no affect on current pump operability.

C/As Initiated (REA, WR, ETC):

Additional C/A Processes Req'd?: Procedure Related

Provide details for any Additional C/A processes needed: Marked up procedure is attached.

Additional Contacts:

Supervisor - CR Review: STURGIS, RUSSELL A

Comments: STURGIS, RUSSELL A:
Returned per Ops request- Entered by [STURGIS, RUSSELL A] from [CR] [Supervisor Review

Is this CR an Operability/Reportability Issue Requiring O/R Review? No

Does this CR affect plant safety? No **Does this CR affect personnel safety?** No

Does this CR involve plant equipment? Yes **Is this CR an environmental concern?** No

Operability / Reportability / SM Review:

O/R Comments: Returned for clarification of impact on TDAFW OD and acceptance criteria of OP test.

OP-AA-102 Review Required? No **Is an IOD Assignment Required?** No

Is a TS SSC Affected? No **Can IOD be Established?** (None)

TS SSC Operability Assessment: N/A

Basis for operability:

LCO Entered: No **Applicable LCO:**

Is an Operability Assessment req'd for an SSC, which is Functional for its TRM function, to demonstrate operability for its TS function? No **Does it Impact a TS SSC?** N/A

Non-TS SSC Functionality Assessment: N/A **Is a RAS Assignment Needed?** No

SSC Qualification Status: N/A **Leakage Category:** (None) **Severity:** (None)

Reportable Condition? No

Reportability Comments:

CRT Comments:

PCR assignment to Procedures.
Review the procedure issues listed in the CR and make changes as required.

--

Significance: 3 **Potential Repeat:** No **Deficiency Type:** Non-Equipment

Affected Dept: MILL - Engineering - Site MILL - Operations MILL - Procedures

Cook, William

From: Finney, Patrick
Sent: Thursday, August 28, 2014 9:49 AM
To: Cook, William; Arner, Frank; Chambers, Michael
Subject: MS3 - SIT - Report has been signed

Understanding we may have a conference, the report is signed so you may consider deleting old material.

Pat Finney
Salem SRI
856-935-3850

Cook, William

From: McLaughlin, Marjorie
Sent: Thursday, August 07, 2014 6:40 AM
To: Cook, William; Finney, Patrick
Subject: MS TDAFW

Good Morning, Pat and Bill,

I just wanted to check in with you on the MS TDAFW inspection report/preliminary determination letter (PDL). Would you like me to provide you an example of a recent PDL that was issued, so you could see the language? If not, and you are already working off of one, that is fine, and I will review it when it comes around for concurrence. I also wanted to remind you that OE and NRR asked to be on concurrence for the PDL. The way that works is that I will provide it to OE electronically after you receive the RI concurrences (up to, but not including, the signatory). OE will coordinate the review with NRR.

Please feel free to contact me with any questions in the meantime. I am happy to review an early draft if you like, before you put it in concurrence, if you want a sanity check at all.

Marjey

Marjorie McLaughlin
Senior Enforcement Specialist
US NRC Region I
Phone: 610-337-5240
Fax: 610-337-5208

Cook, William

From: Finney, Patrick
Sent: Friday, August 08, 2014 2:38 PM
To: Cook, William; Ambrosini, Josephine; Patel, Ami; Chambers, Michael; Haagensen, Brian
Cc: McKinley, Raymond; Shaffer, Steve; DeBoer, Joseph
Subject: MS3 - SIT REPORT - For initial chop
Attachments: MillstoneIR1408_RevC.docx

Attached is Rev C of the draft report. I'm requesting you chop the report and give me feedback as soon as possible. I anticipate putting this into concurrence end of day Tuesday.

Pat Finney
TSAB BC (Acting)
610-337-6959

Cook, William

From: Finney, Patrick
Sent: Wednesday, August 13, 2014 6:39 AM
To: Cook, William
Subject: MS3 - SIT report

Bill,
Question came up as to whether we need last sentence below anymore. Request your feedback.

The total change in CDF associated with the reduction in TDAFW pump reliability for the period between August 2013 and January 2014 is the sum of internal and external conditional core damage frequencies (9.8E-8 + 7.6E-6 = 7.7E-6), which is of preliminary White, or low to moderate overall safety significance. This finding should be characterized as preliminary White in the SIT inspection report and accompanying choice letter. Additional opportunity for information or risk insights development and sharing should be afforded the Dominion PRA staff upon review of this risk evaluation.

Pat Finney
TSAB BC (Acting)
610-337-6959

Graneto, Nora

From:	McKinley, Raymond
Sent:	Thursday, August 28, 2014 7:33 PM
To:	Graneto, Nora
Subject:	Fw: Millstone Power Station - NRC Special Inspection Report 05000423/2014008 with Preliminary White Finding
Attachments:	Millstone IR1408_final.docx; Millstone IR1408_final.pdf

Nora,

Here is the MIllstone TDAFP SIT with a White finding.

Ray

Sent via My Workspace for iOS

---------- Forwarded Message ----------
From: "Pinkham, Laurie" <Laurie.Pinkham@nrc.gov>
Date: Thursday, August 28, 2014 at 3:06:58 PM
Subject: Millstone Power Station - NRC Special Inspection Report 05000423/2014008 with Preliminary White Finding
To: "R1ORAMAIL RESOURCE" <R1ORAMAIL.RESOURCE@nrc.gov>, "R1DRSMAIL RESOURCE" <R1DRSMAIL.RESOURCE@nrc.gov>, "Bickett, Brice" <Brice.Bickett@nrc.gov>, "McKinley, Raymond" <Raymond.McKinley@nrc.gov>, "Shaffer, Steve" <Steve.Shaffer@nrc.gov>, "DeBoer, Joseph" <Joseph.Deboer@nrc.gov>, "Ambrosini, Josephine" <Josephine.Ambrosini@nrc.gov>, "Haagensen, Brian" <Brian.Haagensen@nrc.gov>, "Day, Neil" <Neil.Day@nrc.gov>, "Screnci, Diane" <Diane.Screnci@nrc.gov>, "Sheehan, Neil" <Neil.Sheehan@nrc.gov>, "McNamara, Nancy" <Nancy.McNamara@nrc.gov>, "Tifft, Doug" <Doug.Tifft@nrc.gov>, "Bowers, Anthony" <Anthony.Bowers@nrc.gov>, "Kim, James" <James.Kim@nrc.gov>, "Cook, William" <William.Cook@nrc.gov>, "Arner, Frank" <Frank.Arner@nrc.gov>, "Finney, Patrick" <Patrick.Finney@nrc.gov>, "Chambers, Michael" <Michael.Chambers@nrc.gov>, "ROPreports Resource" <ROPreports.Resource@nrc.gov>, "RidsNrrDorlLpl1-1 Resource" <RidsNrrDorlLpl1-1.Resource@nrc.gov>, "NRR_Reactive_Inspection Resource" <NRR_Reactive_Inspection.Resource@nrc.gov>
Distribution:

Millstone Power Station - NRC Special Inspection Report 05000423/2014008 with Preliminary White Finding

ADAMS Document Accession No: ML14240A051
ADAMS Document Profile As: Public/Non-Sensitive

Laurie Pinkham
Administrative Assistant
Division of Reactor Projects
(610) 337-5384

A/18

Welling, Blake

From: Tifft, Doug
Sent: Thursday, August 28, 2014 2:45 PM
To: Powell, Gerry; McNamara, Nancy; Sheehan, Neil; Screnci, Diane
Cc: Jackson, Donald; Trapp, James; Welling, Blake; Pinkham, Laurie; McKinley, Raymond
Subject: RE: MILLSTONE POWER STATION UNITS 2 AND 3 - NRC SPECIAL INSPECTION REPORT 05000336/2014011 AND 05000423/2014011

State and Congressional notifications have been completed. Issue on listserv at your convenience.

-Doug

From: Powell, Gerry
Sent: Thursday, August 28, 2014 12:03 PM
To: Tifft, Doug; McNamara, Nancy; Sheehan, Neil; Screnci, Diane
Cc: Jackson, Donald; Trapp, James; Welling, Blake; Pinkham, Laurie; McKinley, Raymond
Subject: MILLSTONE POWER STATION UNITS 2 AND 3 - NRC SPECIAL INSPECTION REPORT 05000336/2014011 AND 05000423/2014011

Doug, Millstone received IR at 11:40.

ADVANCED COPY OF

MILLSTONE POWER STATION UNITS 2 AND 3 – NRC SPECIAL INSPECTION REPORT 05000336/2014011 AND 05000423/2014011
ADAMS ACCESSION NO. ML14240A006
AND
MILLSTONE POWER STATION – NRC SPECIAL INSPECTION REPORT 05000423/2014008 WITH PRELIMINARY WHITE FINDING
ADAMS ACCESSION NO. **ML14240A051**

A/19

From: McKinley, Raymond
To: Lori.J.Armstrong@dom.com
Cc: Ambrosini, Josephine; Haagensen, Brian; McKown, Louis
Subject: TDAFP - Preliminary White Finding
Date: Monday, September 08, 2014 4:16:17 PM

Lori,

Given your verbal response to accept the preliminary white finding and associated violation, we (NRC) have 90 days to render our final significance determination. So, we need to issue a final decision by November 26. I doubt that it will take that long, and I will keep you advised as we move along in the process.

Regards,

Ray

A/20

Tifft, Doug

From: McKinley, Raymond
Sent: Thursday, August 28, 2014 2:45 PM
To: Tifft, Doug
Subject: RE: MILLSTONE POWER STATION UNITS 2 AND 3 - NRC SPECIAL INSPECTION REPORT 05000336/2014011 AND 05000423/2014011

Thanks!

From: Tifft, Doug
Sent: Thursday, August 28, 2014 2:45 PM
To: Powell, Gerry; McNamara, Nancy; Sheehan, Neil; Screnci, Diane
Cc: Jackson, Donald; Trapp, James; Welling, Blake; Pinkham, Laurie; McKinley, Raymond
Subject: RE: MILLSTONE POWER STATION UNITS 2 AND 3 - NRC SPECIAL INSPECTION REPORT 05000336/2014011 AND 05000423/2014011

State and Congressional notifications have been completed. Issue on listserv at your convenience.

-Doug

From: Powell, Gerry
Sent: Thursday, August 28, 2014 12:03 PM
To: Tifft, Doug; McNamara, Nancy; Sheehan, Neil; Screnci, Diane
Cc: Jackson, Donald; Trapp, James; Welling, Blake; Pinkham, Laurie; McKinley, Raymond
Subject: MILLSTONE POWER STATION UNITS 2 AND 3 - NRC SPECIAL INSPECTION REPORT 05000336/2014011 AND 05000423/2014011

Doug, Millstone received IR at 11:40.

ADVANCED COPY OF

MILLSTONE POWER STATION UNITS 2 AND 3 – NRC SPECIAL INSPECTION REPORT 05000336/2014011 AND 05000423/2014011
ADAMS ACCESSION NO. ML14240A006
AND
MILLSTONE POWER STATION – NRC SPECIAL INSPECTION REPORT 05000423/2014008 WITH PRELIMINARY WHITE FINDING
ADAMS ACCESSION NO. M**L14240A051**

A/21

Tifft, Doug

From: McKinley, Raymond
Sent: Monday, July 28, 2014 7:49 AM
To: Sheehan, Neil; Screnci, Diane
Cc: McNamara, Nancy; Tifft, Doug
Subject: If asked about previous Millstone SITs

Neil,

We have completed our inspections for both of the previous SITs, and we exited the LOOP SIT about 2 weeks ago and the Unit 3 TDAFP SIT last Monday. The reports come out within 45 days of the exit, so the LOOP SIT will probably go out by the last week in August and the TDAFP SIT by the first week in September at the latest.

I am driving up to Millstone today for a previously planned trip. Shaffer and DeBoer are in the office. I will be hard to reach until I get up to the New London area.

Ray

Sent via My Workspace for iOS

A/22

Tifft, Doug

From: McKinley, Raymond
Sent: Thursday, June 05, 2014 4:52 PM
To: McNamara, Nancy; Tifft, Doug
Subject: Millstone SIT Update

Nancy,

I left you a voicemail on your cell. The SIT will be conducting a "debrief" this afternoon, but we will NOT be exiting at this time. We still need additional information for several issues. The team will most likely exit about 2 weeks from now, but the specific date of the formal exit is still TBD. I will let you know the date of the exit when I get that info.

Ray

A/23

Tifft, Doug

From: McKinley, Raymond
Sent: Saturday, May 03, 2014 1:53 PM
To: McNamara, Nancy; Tifft, Doug
Subject: FW: MS3 - SIT Exit - Date/Time provided

Nancy & Doug,

Millstone planned SIT exit date and time next week.

Ray

-----Original Message-----
From: Finney, Patrick
Sent: Monday, April 28, 2014 1:44 PM
To: Ambrosini, Josephine; Arner, Frank; Chambers, Michael; Cook, William
Cc: McKinley, Raymond
Subject: MS3 - SIT Exit - Date/Time provided

All,
SIT Exit data follows:
When: Friday, May 09, 2014 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Millstone 403

Ray,
Provided for management awareness. Please let me know if someone at the Director level or above intends to attend or dial in from a bridge. Thanks.

A/24

Tifft, Doug

From: McNamara, Nancy
Sent: Tuesday, April 22, 2014 10:52 AM
To: Finney, Patrick; McKinley, Raymond
Cc: Tifft, Doug
Subject: Millstone SIT :Re: State Participation

Hi Pat, we heard the SIT team will be finishing up their inspection on May 7-9, 2014. Mike Fersick, State of Connecticut, will like to attend the exit. When you have the exit information, can you keep us in loop so we can get the information to him. If you would like to reach out to Mike directly his number is (860) 424-3517. Jo has frequent contact with him also.

Thanks,
Nanc

A/25

McNamara, Nancy

From: McNamara, Nancy
Sent: Tuesday, June 17, 2014 10:06 AM
To: Firsick, Michael (Michael.Firsick@ct.gov)
Cc: Tifft, Doug
Subject: SIT #1 and #2 Updates

Mike, wanted to bring you up to date on the status of both SITs that were conducted in the last couple of months at Millstone. The first SIT regarding the repetitive failures of the turbine driven auxiliary feedwater pump, (I believe you attended the exit), the team is continuing to review additional information to enable us to determine significance. There will be some additional onsite followup in the next couple of weeks. Since there has been additional onsite inspection or should the preliminary significance change, we will probably have to re-exit sometime in mid-July.

With respect to the recent SIT from the LOOP event, the team continues to review material in office and it's expected their initial exit should be conducted also in mid-July.

We will keep you informed of the exit dates. Of course if you cannot make the exits, we will be happy to arrange a briefing via telephone at the appropriate time.

Regards,
Nancy

A/26

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
2100 RENAISSANCE BOULEVARD, SUITE 100
KING OF PRUSSIA, PENNSYLVANIA 19406-2713

SPECIAL INSPECTION TEAM CHARTER

January 31, 2014

MEMORANDUM TO: Raymond R. McKinley, Manager
Special Inspection Team

Patrick W. Finney, Leader
Special Inspection Team

FROM: Michael L. Scott, Acting Director ***/RA EJBenner for/***
Division of Reactor Projects

Raymond K. Lorson, Director ***/RA JFRogge for/***
Division of Reactor Safety

SUBJECT: SPECIAL INSPECTION TEAM CHARTER – MILLSTONE NUCLEAR POWER STATION UNIT 3 – FAILURE OF THE TURBINE-DRIVEN AUXILIARY FEEDWATER PUMP

Based on our initial evaluation of the safety significance associated with the failure of the turbine-driven auxiliary feedwater (TDAFW) pump during a January 23, 2014 surveillance test, and previous test failures in which corrective actions were apparently ineffective, a Special Inspection Team (SIT) is being chartered. The special inspection will expand on the inspection activities started by the resident inspectors immediately following the pump surveillance test failure and will review Dominion's response to the test and equipment failure in accordance with the attached charter.

This special team inspection was initiated in accordance with NRC Management Directive (MD) 8.3, "NRC Incident Investigation Program," and Inspection Manual Chapter (IMC) 0309, "Reactive Inspection Decision Basis for Reactors." The decision to conduct this special inspection was based on deterministic criteria (i.e. repeat failures of safety-related equipment) in MD 8.3 and the results of a preliminary risk assessment that placed the core damage risk for the event in the low to mid E-6 range.

The inspection will be conducted in accordance with the guidance of NRC Inspection Procedure 93812, "Special Inspection," and the inspection report will be issued within 45 days following the final exit meeting for the inspection.

A/27

The special inspection will commence on February 3, 2014. The following personnel have been assigned to this effort:

Manager:	Raymond R. McKinley, Branch Chief, Projects Branch 5, Division of Reactor Projects (DRP), Region I
Team Leader:	Patrick W. Finney, Senior Resident Inspector DRP, Region I
Full Time Member:	Mike Chambers, Senior Inspector DRS, Region IV
Full Time Member:	Frank Arner, Senior Inspector DRS, Region I
Part Time Member:	William Cook, Senior Reactor Analyst DRS, Region I

Enclosure: Special Inspection Charter

The special inspection will commence on February 3, 2014. The following personnel have been assigned to this effort:

Manager:	Raymond R. McKinley, Branch Chief, Projects Branch 5, Division of Reactor Projects (DRP), Region I
Team Leader:	Patrick W. Finney, Senior Resident Inspector DRP, Region I
Full Time Member:	Mike Chambers, Senior Inspector DRS, Region IV
Full Time Member:	Frank Arner, Senior Inspector DRS, Region I
Part Time Member:	William Cook, Senior Reactor Analyst DRS, Region I

Enclosure: Special Inspection Charter

Distribution w/encl: (via email)

W. Dean, RA
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R. McKinley, DRP
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J. DeBoer, DRP
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J. Ambrosini, DRP
B. Haagensen, DRP
J. Krafty, DRP
D. Screnci, PAO
N. Sheehan, PAO
N. McNamara, SLO
D. Tifft, SLO
E. Quinones, RI OEDO
J. Kim, NRR, PM
W. Cook, DRS
F. Arner, DRS
P.Finney, DRP
M. Chambers, RIV, DRS
NRR Reactive Inspection Resources

DOCUMENT NAME: G:\DRP\BRANCH5\3-MS\MS SPECIAL INSPECTION AFW OVERSPEED\MS SIT Charter final .docx
Non-Public Designation Category: MD 3.4 Non-Public B.1 (A.3 - A.7 or B.1)
ADAMS ACCESSION NUMBER: **ML14031A320**

☑ SUNSI Review		☑ Non-Sensitive ☐ Sensitive		☐ Publicly Available ☑ Non-Publicly Available	
OFFICE	RI/DRP	RI/DRP	RI/DRS	RI/DRP	
NAME	PFinney/PWF via email	RMcKinley/RRM	RLorson/JFR for	MScott/EJB for	
DATE	1/29/14	1/30/14	1/30/14	1/31/14	

OFFICIAL RECORD COPY

Special Inspection Charter
Millstone Nuclear Power Station Unit 3
Multiple Turbine-Driven Auxiliary Feedwater (TDAFW) Pump failures from May 2013 to January 23, 2014

Background:

On May 15, 2013, at the end of the refueling outage, Dominion observed that the Millstone Unit 3 turbine-driven auxiliary feedwater (TDAFW) pump was experiencing speed oscillations of approximately ± 100 rpm (or approximately ±5% of average speed) when operating in low flow conditions following a full-flow surveillance test. The pump speed oscillated within 2.8 percent of the overspeed trip setpoint at 4746 rpm. The speed oscillations caused swings in the discharge pressure of ±105 psig (approximately ±10% of average discharge pressure) which approached within 1.1% of the discharge relief valve setpoint. These oscillations are both within the 3% setpoint tolerances for the respective devices. After troubleshooting and several adjustments to the turbine speed control governor, the pump did not achieve the required differential pressure during a second full flow test on May 17. Dominion subsequently determined that the oscillations did not reduce pump reliability and attributed the full-flow low differential pressure to the instability of the governor. Dominion concluded that TDAFW pump differential pressure remained above the design requirements specified in the accident analysis and determined the pump was operable.

A reactor trip occurred at Unit 3 on August 9, 2013. The TDAFW pump governor linkage was observed to be misaligned, and the pump was noted to be oscillating when operating at low flow rates. Discharge pressure exceeded the discharge relief valve lift setpoint (1850 psig) and fluctuated between 1869 psig and 1609 psig. In addition, speed fluctuated between 4656 rpm and 4350 rpm with the overspeed trip setpoint set at 4746 ±142 rpm. The system engineer requested that the pump be shut down when it was no longer required (after approximately four hours of operation) to facilitate troubleshooting. The shift manager stopped the TDAFW pump, declared the pump inoperable, and entered Technical Specification 3.7.2.1 on August 10. Troubleshooting revealed that the governor control linkage was out of adjustment (cam plate misaligned to the cam follower) and the governor compensator was not set correctly. Operation of the TDAFW pump in low flow conditions with an unstable governor could challenge the lift setpoint of the discharge relief valve and result in its opening. Excessive TDAFW pump speed oscillations were believed to challenge the overspeed trip feature of the TDAFW pump and could result in tripping the TDAFW pump when it is needed. On August 12, Millstone adjusted the governor compensator to eliminate the oscillations but that adjustment made the governor less responsive (more sluggish). They also corrected the problems identified above with the governor linkage.

Subsequently, on November 4, 2013, during routine quarterly surveillance testing of TDAFW system, the TDAFW pump tripped on overspeed shortly after the pump starting. At that time, Dominion believed the cause was water intrusion into the pump via condensate in the steam supply lines. An increased monitoring and surveillance plan was developed. Dominion then began running surveillance runs weekly to demonstrate continued operability of the pump. On December 18, 2013, they experienced another overspeed trip when the "D" steam line was un-isolated following repairs to a steam leak. Dominion attributed the overspeed trip to condensate in the "D" steam line. With regards to water intrusion, the licensee implemented a number of compensatory measures and ran a number of surveillance tests to demonstrate operability.

On January 23, 2014, during the weekly surveillance run of the TDAFW pump, it again tripped on overspeed. Dominion did not attribute this trip to water intrusion as the cause because they implemented corrective actions to prohibit condensate intrusion into the pump following the two trips above. Dominion identified, during subsequent troubleshooting, that a key link in the governor control linkage had been installed incorrectly and was mechanically binding, thus preventing the governor from establishing proper control of the turbine during a start sequence. In addition, Dominion identified that the thrust output from the governor module was ~ 70 lbf, whereas a value of 300 lbf was expected. Following the granting of a NOED to complete repairs on January 26, 2014, the TDAFW pump was returned to service and declared operable at 0505 on January 27, 2014.

Dominion is currently completing a root cause evaluation and the resident inspectors continue to conduct baseline inspections with assistance from Division of Reactor Safety specialists. Additionally, Millstone has launched a Focus team tasked to review the past ten years of operational practice, preventive maintenance, industry experience, and other information for the TDAFW pump.

Basis for the Formation of the Special Inspection Team:

The failure of the TDAFW pump involved a failure of safety-related equipment. There have been equipment and performance issues related to this pump dating back to the conclusion of the outage in May 2013. Additionally, in the 3rd Quarter Resident Inspection Report of 2013, there is a finding that involves an inadequate operability determination related to governor performance on this pump.

Using the Millstone Unit 3 SPAR model, the Region I Senior Reactor Analyst (SRA) calculated the conditional core damage probability for the TDAFW pump overspeed trip failures and associated unavailability times. Based upon best available information and a review of the known problems with the TDAFW pump since August 2013, the SRA made the following conservative assumptions to estimate the risk associated with the unreliability and unavailability of the pump: 1) the exposure time of the problems involving the turbine-driven pump date back to restart of the unit on August 12, 2013, and includes approximately 4,000 hours; 2) during surveillance testing conducted between November 4, 2013, and January 12, 2014, the TDAFW pump failed on demand (due to overspeed) 3 times out of approximately 9 starts; this 0.33 failure probability is used rather than the nominal 0.0649 value, to reflect actual failure to start probability for the exposure period; and 3) conservatively, no operator recovery credit following an overspeed trip failure was assigned. The SRA used the zero Test & Maintenance model for this risk assessment, in accordance with established guidance.

The calculated conditional core damage probability (CCDP) is: 1.52E-6.

If an operator recovery credit was to be assigned of a 1 in 10 chance of failure; the estimated revised CCDP would be 1.52E-6 X 1/10 = 1.52E-7. If the external event contribution were to be added, due to the importance of the TDAFW pump for fire mitigation, preliminary values obtained from the licensee would result in the CCDP increasing to the middle of the E-6 range.

Based upon best available information and the uncertainty of assigning a recovery credit because of the unknown TDAFW pump failure mechanism(s), the 1.52E-6 CCDP value was selected to represent the estimated risk increase associated with the Inspection Manual Chapter

(IMC) 0309 reactive inspection assessment. This CCDP value places the risk in the "No Additional Inspection" to Special Inspection Team overlap region.

Based upon the preliminary CCDP estimate of low E-6 range, in accordance with IMC 0309, this event falls within the range for a Special Inspection Team.

Objectives of the Special Inspection:

The objectives of the special inspection are to review and assess: (1) Dominion's planning and execution of the risk significant work activities on the TDAFW system; (2) equipment issues related to the TDAFW testing; and (3) Dominion's response to this significant equipment failure.

To accomplish these objectives, the following will be performed:

1. Review whether there should be any enforcement action associated with the granting of the NOED.

2. Generate a timeline of events which captures the failures, maintenance evolutions, and tests performed on the TDAFW system.

3. Evaluate the adequacy and completeness of the maintenance on the TDAFW system, including preventive maintenance, maintenance practices, procedural guidance, post-maintenance testing, and supervisory oversight.

4. Evaluate Dominion's application of pertinent industry operating experience and evaluation of potential precursors including the adequacy of any actions taken in response to the operating experience or precursors.

5. Evaluate the adequacy of Dominion's response to the TDAFW system failures, including Dominion's cause analyses, extent of condition, corrective actions, and failure mode considerations.

6. Verify the licensee met the proper reporting requirements of 10 CFR 50.72 and 10 CFR 50.73. Also determine if the licensee has plans to issue a Licensee Event Report to document this issue.

7. Evaluate the adequacy of Dominion's past operability with regards to the TDAFW system.

8. Evaluate Dominion's assessment of the risk significance of the degraded condition, including evaluation of input assumptions and independently evaluate the risk significance.

9. Evaluate the adequacy of Dominion's final root cause for the TDAFW system failures. (Approximate completion date March 2014)

Additionally, the team leader will review lessons learned from the Special Inspection and, if appropriate, prepare a feedback form on recommendations for revising the Reactor Oversight Process baseline inspection procedures in order to proactively identify the issues and causes involved with the event.

Guidance:

Inspection Procedure 93812, "Special Inspection," provides additional guidance to be used by the Special Inspection Team. Team duties will be as described in Inspection Procedure 93812. The inspection should emphasize fact-finding in its review of the circumstances surrounding the event. It is not the responsibility of the team to examine the regulatory process. Safety concerns identified that are not directly related to the event should be reported to the Region I office for appropriate action.

The Team will conduct an entrance meeting and begin the initial onsite inspection on February 3, 2014. While on site, the Team Leader will provide daily briefings to Region I management, who will coordinate with the Office of Nuclear Reactor Regulation, to ensure that all other parties are kept informed. Additional inspection activities will continue through completion of Dominion's final root cause analysis. The inspection is anticipated to complete in March 2014. A report documenting the results of the inspection should be issued within 45 days of the completion of the inspection. This Charter may be modified should the team develop significant new information that warrants review.

McNamara, Nancy

From: McKinley, Raymond
Sent: Wednesday, January 29, 2014 1:50 PM
To: McNamara, Nancy; Tifft, Doug
Cc: Sheehan, Neil; Screnci, Diane; Benner, Eric; Scott, Michael; Lorson, Raymond
Subject: Millstone SIT Comm Plan Has Begun

Nancy & Doug,

Millstone plant management was just informed of our decision to initiate an SIT at Millstone. Our team will entrance on Monday (February 3). I am the Team Manager and Pat Finney is the Team Leader. Full time team members include Frank Arner from DRS and Mike Chambers from Region IV. Mike is a Turbine Driven Aux Feed Pump expert.

Our inspection will occur in 2 phases. The first phase will occur next week. The second phase will occur when the licensee completes their Root Cause Analysis, and we tentatively anticipate that we will complete our inspection and conduct our exit meeting in the March timeframe. Our final report will be issued within 45 days of our exit meeting. The exit meeting is non-public.

Neil Sheehan indicated that our press release will go out on Monday to coincide with our entrance, and we will provide the licensee a copy of our press release 1 hour before we go public with it.

Please advise when your notifications are complete.

Ray McKinley

A/28

McNamara, Nancy

From:	McNamara, Nancy
Sent:	Monday, February 03, 2014 1:08 PM
To:	Firsick, Michael (Michael.Firsick@ct.gov)
Cc:	Raymond McKinley (raymond.mckinley@nrc.gov); Douglas Tifft (doug.tifft@nrc.gov); Finney, Patrick
Subject:	Press release on Millstone SIT & inspect. information
Attachments:	Millstone3SpecialInspection.2-3-2014.pdf
Importance:	High

Good Afternoon, Mike. Wanted to let you know that the NRC will be releasing the attached press release announcing the Millstone Special Inspection. This is normal practice for these types of inspections. The inspection team is onsite, beginning their inspection and the Team Leader in Pat Finney. I understand from Doug that you will not be observing the inspection but you are interested in the exit.

The inspection is a two-phased approach: the inspection conducted onsite this week and then a review and assessment of the licensee's root cause report, once completed (probably March/April, timeframe). There will be an informal debrief of the inspection observations sometime this Thursday or Friday. Then there will be a formal inspection exit when both phases of the inspection are completed this spring.

Doug and I would like to offer to catch up with you early next week and debrief you on this week's activities and observations. Of course, if you prefer to go to the site and observe the debrief yourself, you may do so. If so, let us know so we can keep you informed of the day and time when that is to occur.

Regards,
Nancy

A/29

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No: I-14-004
CONTACT: Diane Screnci, 610-337-5330
Neil Sheehan, 610-337-5331

Feb. 3, 2014

NRC BEGINS SPECIAL INSPECTION AT MILLSTONE UNIT 3 NUCLEAR POWER PLANT

The Nuclear Regulatory Commission has begun a Special Inspection at the Millstone Unit 3 nuclear power plant to further review repetitive problems involving a pump that is part of a reactor safety system. The inspection will get under way today (Feb. 3) at the plant, which is located in Waterford, Conn., and operated by Dominion Nuclear Connecticut Inc.

The inspection, to be conducted by a four-member team, will focus on a turbine-driven auxiliary feedwater pump for the plant. The auxiliary, or back-up, feedwater system is one of several that can be used to help cool down the reactor following a shutdown by pumping water into the secondary side of the plant's steam generators. The steam generators are essentially large heat exchangers that convert heat produced by the reactor into steam, which in turn is used to spin the plant's turbine and generate electricity.

Among the areas to be reviewed during the Special Inspection are Dominion's responses to the issues, including the adequacy and completeness of testing on the pump and root-cause evaluations of the problems. It will expand on earlier assessments performed by the NRC Resident Inspectors assigned to Millstone on a full-time basis and by NRC specialist inspectors.

"We have witnessed problems involving this safety-related component stretching back to last May," NRC Region I Administrator Bill Dean said. "The fact that these issues occurred on multiple occasions despite repeated efforts to repair this component has prompted us to take a closer look at the situation."

On May 15, 2013, at the end of a refueling and maintenance outage, plant personnel observed that the turbine-driven auxiliary feedwater pump was experiencing speed oscillations, or unexpected fluctuations, during testing. There were also problems involving the pump on several other dates, most recently on Jan. 23, 2014. The issues included oscillations and overspeeding.

NRC Resident Inspectors at Millstone have been closely following up on these issues with support from Region I specialist inspectors and other technical experts. For example, the third-quarter integrated inspection report for the plant includes a finding for an inadequate operability determination by the company related to the performance of the speed-controller for the pump.

The inspection team will document its findings and conclusions in a report to be issued within 45 days of the end of the review.