

Submitted: December 22, 2011

**From:** Rutkoske, Michael  
**Sent:** Saturday, November 19, 2005 12:21 PM  
**To:** Verrochi, Steven <SVerroc@entergy.com>  
**Cc:** Hinrichs, Gary <ghinric@entergy.com>; Leach, Don <DLeach@entergy.com>; Azevedo, Nelson <nazeved@entergy.com>; Deeds, Paul <pdeeds@entergy.com>; Deeds, Paul <pdeeds@entergy.com>  
**Subject:** Re: Spent Fuel Pool Exams - What's Next?

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Thank you Steve. We will talk to Nelson on Monday.

Mike

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Sent from my BlackBerry Wireless Handheld

-----Original Message-----

From: Verrochi, Steven <SVerroc@entergy.com>  
To: Rutkoske, Michael <mrutkos@entergy.com>  
Sent: Fri Nov 18 19:01:26 2005  
Subject: FW: Spent Fuel Pool Exams - What's Next?

Mike,

I hope meets your needs for developing an approach to continue the inspection. He identifies a lot of issues to overcome but it looks like ROV Technologies may have the equipment we need. Nelson is in on Monday and Tuesday to discuss further.

I'll be back after the holiday, Steve Verrochi

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From: Deeds, Paul  
Sent: Friday, November 18, 2005 5:35 PM  
To: Rutkoske, Michael  
Cc: Verrochi, Steven; Azevedo, Nelson; Deeds, Paul  
Subject: Spent Fuel Pool Exams - What's Next?

Mike:

I believe there are four areas that still need to be evaluated. First, the completion of the examinations of the accessible areas of the spent fuel pool. Second, the evaluation of the anomalies that we have already documented, beyond the three rust spots we have already vacuum box tested. Third, what is needed to be able to examine the spent fuel floor, under the existing fuel racks. Fourth, what is needed to be able to examine the spent fuel walls; currently inaccessible due to the close proximity of the fuel racks to the wall.

First, we have determined that the only accessible areas of the spent fuel pool that we have not currently examined are the fuel transfer canal and the return cooling alcove. The alcove in the southwest corner at the 90' elevation and is separated from the fuel pool by a debris screen. With the fuel transfer canal drained down, we have been told that is not a suspect area. The return cooling alcove area however, being near the leak in the southwest corner is an area that warrants investigation. Our plan is to inspect that area on Monday and Tuesday (11/21 & 11/22). We anticipate being able to reach over the railing in that area, holding the pool by hand (as apposed to attaching it to the refueling bridge) and articulate the camera by hand and by it's motorized pan and tilt. To accomplish this examination we will need the assistance of Operations to turn off the spent fuel pool cooling for approximately 3 hours. We are looking to request that Monday afternoon or

Tuesday morning. We will also need assistance in obtaining an FME monitor, since even though the work will not be in the spent fuel pool proper, it will still be within the FME boundary.

Second, we have documented an additional 35 indications that appear "peculiar". Realizing that is not an usual inspection term, it is very important for everyone to understand that by any welding standard, there are hundreds to more than a thousand indications in the accessible areas that would be considered unacceptable and a potential cause of a leak. The three indications that we have vacuumed box examined appeared to be the most severe. There are other indications that are located mid-span in the plates that could be leaking, with no associated rust indications, since there is not carbon steel reinforcement behind much of the pool. Since those indications are located over fuel racks, the initial response from the radiation protection department was that a dive to perform a vacuum box examination would not be possible. I am not sure that a remote vacuum box examination is possible without extensive tooling. As you probably remember, the difficulty the diver had performing the examination directly at the examination location. As the next step in evaluating those 35 indications, lacking any evaluation or acceptance criteria, I would like to request that our metallurgist, Bill Spataro sit down with the Underwater Constructors examiner and myself to decide which indications should be perused for further evaluation. Once we have identified which indications pose the greatest leak threat, we would have radiation protection perform surveys of those areas to determine the feasibility of performing a dive. In parallel, we would need to contact a company experienced in remote delivery systems to design a tool to remotely deliver and secure the vacuum box system.

Third, the examination of the spent pool floor will be challenging. While low profile remote cameras are available (we have one that has a fixed forward and rear view) that could be driven under the fuel racks; but to obtain meaningful results is an entirely different story. As a minimum, the camera cannot view at an angle any shallower than 30 degrees from the surface being examined. Combined with obstacles caused by the fuel rack supports, pan and tilt capabilities would be highly desirable. This is a time consuming endeavor. As a time point of reference, the first reactor head examinations took over 24 hours to perform. Those exams were semi-remote as we had access to both sides of the head for positioning. The examination area was much smaller than to examine the entire floor of the fuel pool. Maintaining orientation and assuring 100% coverage was a great challenge. Loss of orientation at Arkansas Nuclear One resulted in areas that were missed. Another challenge would be the 30 years of debris accumulated on the bottom of the fuel pool. We would need to vacuum the bottom of the pool prior to or concurrently with examining. The alternative to not cleaning would be the equivalent of trying to locate cracks in a sidewalk, with 2" of snow covering the sidewalk. ROV Technologies has indicated that they have a radiation hardened, updated model of our Scarab remote camera system that is capable of inspecting under the fuel racks. That system has a camera which can be aimed at a fixed angle, but does not have pan and tilt capability. The system can also be equipped with a vacuum with tri-nuc filter to clear the debris, prior to inspection. ROV claims recent success at inspection both at Fitzpatrick and Hatch. ROV has indicated that they will need drawings indicating the original configuration of the fuel racks and current drawings. This will assist them with identifying obstacles that could snagged the umbilical cord of the rover, causing it to be permanently trapped under the fuel racks. As a last choice option, fuel could be shuffled to free a fuel rack, one at a time, where examinations could be made either through the bottom of the racks, or by lifting the rack in it's entirety, exposing the floor beneath.

Fourth, the examination of the spent fuel pool wall behind the fuel racks is especially challenging. The gap between the wall and rack has been reported to be 1.5". To obtain an inspection angle greater than 30 degrees from the surface will entail the use of a mirror fitted to the camera. The effective area of interest would be less than 2 square inches causing the examination to take a considerable amount of time. Compare that the two square ft examination area of the accessible south wall took almost two days. There is a concern regarding the ability of a small camera to withstand that amount of radiation emitted by nuclear fuel for that amount of time. ROV has indicated that they have an extremely small, radiation hardened camera which will withstand the radiation field. They indicated that the camera is capable of inspecting a gap as narrow as 2", which they accomplished at Fitzpatrick. Unfortunately, there appears to be a delta of .5" for the access of the camera. I have not actually seen the current fuel rack drawings to verify the 1.5" gap. We will seek to verify that dimension and continue to explore with ROV and other vendors the possibility of further reducing the size of the camera system. Again, as a last choice option, fuel could be shuffled to free a fuel rack, one at a time, to provide access to the wall in that area.

While it is important to identify any area of potential leakage, it is also important to consider the ability to repair areas of potential leaks. As pointed out in paragraph two above, there are hundreds of indications that would be considered unacceptable and potential leak paths by any welding standard, in the areas we have examined so far. I would not expect the quality of the floor plates or exposed wall sections to be any different.