INTERVIEW AND AIT NOTES
3/2/2000, Rev. 1

INTERVIEWS

2/28/00, 13:00 - Lou Liberatori

Lou was one of the TSC managers. He was on the first shift starting at about 20:30 on 2/15/00. The TSC was activated at about 21:00. The minimum staffing was a TSC manager, communicator, core physics engineer and two engineers. They also had a systems analyst. Lou's current job at IP2 is in Configuration Management working on the 50.54(f) activities. Lou has been TSC manager on and off for about 15 years. Sometimes he the Technical Advisor to the County. He did not know that he was going to be TSC manager until he arrived at the site. Apparently this is normal. All personnel are called in and then assignments are made.

According to Lou the response organization is in transition such that the OSC and TSC functions will be combined. [The OSC and TSC were, in fact, combined later in the event.] This transition was scheduled for completion April 2000. Procedures were in the process of being changed to reflect the new organization. However, since the new organization was not in place and personnel had not been trained regarding the new organization, there was some confusion as to the current role and responsibility of the TSC and what procedure to use.

A new computer based trending program (called 'pie' or PI) to trend plant parameters has been put in service but this new system was not yet installed on the TSC computers. Per Lou, had this program been available in the TSC it could have helped the TSC personnel to provide better information to the control room.

Lou mentioned that they were so busy for the first hour that they did not have time to take notes. Later when they had a breather they wrote down what had happened to the best of their recollection.

Regarding the N2 supply to the PORV accumulators, the concern is only for a shutdown when the plant enters OPPS (LTOP). To ensure low temperature, over pressure protection for the long term after the plant is shutdown, a jumper is manually installed from the N2 supply to the SI accumulators to the PORV accumulators. This is because there was a CR written about two years ago questioning the adequacy of the size of the PORV accumulators to store N2 for ongoing LTOP protection. The size of the PORV accumulators is not a concern for a DBA or any other plant emergency.

Per Lou the SG generator levels looked reasonable during his watch (about 60" when he got off watch). They were slowly increasing but did not show any indication of an ADV lifting. The pressure set points on the ADVs had been reset to 1030 psig and in one instance the pressure did just get to 1030 psig but Lou didn't think that the ADV lifted. It might have simmered a little which could have been the source of the radiation in the ADV tailpipe.

The situation regarding when to start RHR was being handled in the control room and there was not

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clear direction or support from the TSC. The 300 psig limit on going on RHR was imposed to ensure that an RHR system over pressure condition would not occur when conservatively adding all possible instrumentation errors to the 300# value which could possibly cause the RHR system to reach the 600# pressure rating of the RHR system. The operators wanted to keep the RCPs running when going on RHR which meant going on RHR at a pressure greater than 350 psig.

14:30 - Michael Cheskis, x5317, CCW System Engineer

Senior Engineer. Started with ConEd in Sept 1999. Was a contractor here for a while. Came from Millstone. Has CCW, CVS, and Spent Fuel Cooling systems. Mike was the duty system engineer on back shift when the event occurred so he just happened to be on site. He is not on the normal call out list since he is new to ConEd and has not completed all training requirements. He was on site from 3pm to 11pm the day of the event. Stayed the TSC most of the time.

Asked him questions regarding the RHR Hx CCW outlet valves (MOV-822A & B) which open on a SI signal. The SOP 4.2.1 assumes both are closed and directs the operator to open 822A. Since they were both open, the operator closed 822B to be consistent with the procedure. Mike said that he does review SOPs for his system but only reviews for proper system design parameters such as flow, temperature and pressure. He does not review for accuracy of valve lineups or valve position status during the evolution covered by the SOP. Per Mike that responsibility is with Operations. Al Gorman is supposedly looking at SOPs for accuracy. [The reason the valves were open was because Safety Injection had been initiated which opens the valves per design. There should have been a note or step in the SOP that recognizes this design feature.]

Other areas of concern for the system in general (not related to the event), per Mike, with the CCW system include leaking oil from the pumps. It was determined that the leakage was small enough to not require refilling during a design basis accident. Also, the spare CCW pump is not easily changed out due to physical size differences. Consequently, need to issue several minor mods to remove interferences and provide different structural supports to accommodate the spare pump should it be needed.

Per Mike, System Health reports are currently done every six months before management. But that is to change soon to quarterly reports that are written only and not presented to management.

15:00 - Steve Ghelarducci, x5316, RHR system engineer.

System engineer for about 14 months. Has been at IP2 for about 2 ½ years. Has been with ConEd for

about 17 years.

He was not notified of the event. He is not on the EP team. Heard about the event on the news. Came to work at regular time the next day. Was not called in. Has not been involved much since the event either. He said that is because he is project manager for the turbine generator to investigate the water leakage into the stator during this shutdown.

Per Steve the RHR system performed as designed. Regarding the problem with when to go on RHR the following information was provided:

- It is better to go on RHR when the RCPs are running.
- Per EOP, need to trip RCPs when pressure is less than 350 psig.
- The procedure says to be below 300 psig before going on RHR.
- So EOP procedure change was made, based on discussions with Westinghouse using existing plant conditions, to be able to go on RHR at 380 psig.

[Reportedly, this concern had been previously raised by Westinghouse to change the procedure to allow going on RHR at the higher pressure so RCPs could remain in service and avoid going on natural recirc but the licensee had not done anything about it yet.]

I asked Mike why this concern was not identified sooner, like during simulator training. He said that simulator training would not detect this because the simulator exercises stop before you get to the point of actually going on RHR. [This is typical because simulators are usually not designed to run long enough to get to the point of going on RHR.] So the procedure was not challenged in this area. Also, the EOPs reflect the Westinghouse ERGs. [Though Westinghouse had recently indicated a change should be made in this area the licensee had not done anything yet.]

15:30 - Mike Barlok - AOVs & Matt Walther - MOVs; SJAE and Steam Dumps to the Condenser.

The SJAE pressure control valve PCV-1222 was not in service, has not been for years and is scheduled for retirement because it has never worked properly. However, a similar valve on IP3 has reportedly been working fine. On IP2 the manual bypass valve has been used in place of PCV-1222. The manual valve is positioned for steam flow associated with 100% reactor power. When power is reduced or the plant tripped the position of the manual valve must be changed accordingly and quickly to prevent losing vacuum. This did not happen and vacuum was lost until reestablished with the mechanical hogger and proper positioning of the manual bypass valve.

The steam dump valve to the condenser has controller problems when in automatic but supposedly works OK in manual. In manual you can move the valve groups in either slow speed, by moving the T switch a little, or in fast speed, by moving the T switch all the way over. During the event the valve was operated initially in automatic and was reported to be erratic and jumped in 25% increments making it difficult to control the cooldown rate. So the operators shifted control to manual. This is reported to be

a controller problem when in automatic and not a valve problem. [The manual controller has two speed control. Moving the T switch a little causes the valve group to move at slow speed; moving the switch all the way over causes the valve group to move at fast speed. Based on a simulator exercise it appears the operator moved the T switch enough to cause the valves to go to fast speed, which caused the valves to open more than needed, creating the excessive cooldown.]

The atmospheric dump valves of the #24 SG has a history of leaking. A W/O, P-99-10042, was written in July 1999 and but the response in the CR indicated that the valve was not leaking.

16:00, Kurt Ingram, x 5062 - RCS & Waste Gas

Radioactivity dumped from SJAE to VC is eventually condensed to the containment sump or vented to atmosphere via the VC purge valves.

High delta Ts occurred at pressurizer surge line and spray nozzles. Per the graphs the pressurizer surge line had a cooldown rate of about 220 ^{o}F (allowable is 200 ^{o}F) and a heat up rate of about 110 ^{o}F (allowable is 100 ^{o}F). This is under investigation with assistance from Westinghouse.

2/29/00, 1030, Charlie Hayes - TSC Systems Analyst Coordinator

Works in Corrective Action Group. TSC Analyst for ~ 16 years. With ConEd for 18 years. Was a licensed operator and a trainer of operators. Claims to be the 3rd most knowledgeable person on the site regarding the plant.

Asked him if he thought the atmospheric relief opened on the 24 SG. He said he really couldn't tell if it opened. Perhaps the valve opened since the SG pressure did reach the set point pressure of 1030 psig.

Regarding the steam dumps to the condenser, there are four sets of three valves. There are four lights in the control room that indicate (go on) when each set starts to open. [Also, there is a signal indicator directly above the T switch that shows the signal sent to the valves to open, which is an indirect indication of valve speed and opening signal. So this was another opportunity for the operator to have determined that he opened the valves too far.] The valves are operated by a T-switch which is toggled by the operator to manually open the valves when in the manual mode. The response time of the control system is reportedly about 20-30 seconds. So when the operator toggles and starts the valves opening he needs to wait about 20 seconds to see the effects. Also, it normally takes about 20 seconds after hitting the switch for the first light to go on. It looks like the operator toggled the switch twice (as indicated by the steam flow curve and RCS temperature cooldown rate) in conjunction with causing the over cooling and did not wait long enough after the first toggle to determine the effect. Also, it appears, based on simulator testing, that on one or the other toggle, the operator moved the switch enough to go to fast

speed on the valves. So by the time the excessive cooldown rate was observed it was too late to slow it down. So, according to Charlie, the system behaved as designed. [Subsequent to the event the same scenario was run on the simulator and it matched the time sequence and plant conditions that were observed during the event, including the lag times in the opening of the steam dumps to the condenser and the cooldown rate.]

In the TSC there were 3 Proteus computer monitors, but sometime prior to the event one of the three were removed. Charlie said he needs more than one monitor to do his job. He would rather have different information on different monitors so he can see the information all at once rather than having to switch screens on the same monitor. Charlie says he felt the TSC was 'gutted' of essential equipment needed to properly analyze plant conditions. He said he had to get his laptop and bring it to the TSC and hook into the web to gain access to the PI (pie) program to be able to properly trend plant status.

Regarding the SJAE, the PCV has not been working for a long time. [May have been a cost decision since it is fixable.] Manually throttling for 100% power is OK since you run at 100% nearly all the time. But when the plant trips you can loose the vacuum if you don't reposition the manual valve, which did happen.

Per Charlie, the NRC wanted the plant to stay above 200°F for a longer time than necessary. Staying at the higher temperature is not the safest plant condition to be in. Why did the NRC hold up the process?

Charlie said the operators should have followed the EOP as written and not held up cooldown while deciding when to go on RHR and finally making an EOP change to allow going on RHR at 380 psig rather than the 300 psig in the EOP. Following the procedure was not a problem according to Charlie. The operators preferred not to loose normal pressurizer spray before going on RHR by having to stop the RCPs at 350 psig per procedure and then have to use auxiliary spray. Also, the operators did not want to have to rely on natural circulation since RCPs would not be running.

Per Charlie, operators held temperature and pressure to do OPPS test (this is related to low temperature, over pressure protection) which is important for a normal shutdown but should have not been a reason to hold going to cold shutdown when in an Alert.

Stopping flow thru on of the RHR heat exchangers caused the rapid heat up which almost caused an unplanned mode change at 200 °F. Charlie did not know if this was a procedure weakness or a knowledge weakness.

Charlie said the calculations are showing a pre event reactor coolant to #24 SG leakage of 112 gpm 'cold corrected' and a post event leakage value of 92 gpm. The charging pumps put out about 100 gpm each per design but it is lower than that in reality [reportedly about 150 gpm total from the two charging pumps]. Letdown is normally about 75 gpm. So, per Charlie, it was close as to whether the charging pumps could have kept up without initiation SI even if the rapid cooldown had not occurred [the post

analysis currently shows that proper operator action would have avoided SI].

With all steam dumps to the condenser open the total steam flow is about 40% of full steam flow.

3/1/00, Curt Ingrams - DMIMS (loose parts monitor)

Per CR 200001137 heard impact noises at 30 second intervals in #22 and #24 SGs. Per Curt this is normal during cool downs and heat ups when the equipment is thermally contracting or expanding as the metal temperature changes. Currently the Watch Engineer is carrying the DMIMS as Inop due to a less than normal signal amplification. The system was declared Inop a few months ago due to a bad CPU card. The card was recently replaced and the system seemed to work OK but the signal strength from the new card was lower than it should be causing a low signal alarm. So the licensee is keeping the system in service since it does provide useful information, but officially it remains Inop until I&C can fix the low signal.

3/1/00, 1330, Matt Walthers - Atmospheric Dump Valves

PCV-1137. The first 10% of stroke only opens the inner plug which would only release about 0.6 lbm of steam. Then the main plug starts to open and opens to a point based on the pressure differential between SG pressure and the set point. The valve does not keep opening if there is a constant differential pressure, it only opens more if the differential pressure increases to the new 'mismatch' position.

3/1/00, 1408, Bob Eifler, x5414 - Control Rods

The computer printout did not indicate a stuck rod. The rod associated with computer point C0001 did show 4 steps out but this is 4 steps out of 223 steps. Anything less than about 10 steps is considered on the bottom. The rod bistables are set at about 20, so that a rod has to be more than 20 steps out to indicate not on the bottom as far as the bistables are concerned. Subsequent to the event all rod bistables had tripped indicating no stuck rods.

3/1/00, 1430, Frank Golomb - Steam Dumps to the condenser.

There are two modes of operating the steam dumps, manual and automatic. In automatic you can operate in the pressure mode or the temperature mode. When the plant is operating the system is normally in automatic and in the temperature mode (Tavg vs 1st stage turbine temperature). When the plant is shutdown the system is in automatic and in the pressure mode with the pressure set at around 1000 psig, i.e., below the atmosphere dump valve set point.

There are four groups of 3 valves. In each group all 3 valves open together. There is a light on the control panel for each of the four groups. The light goes on when the valve set lifts off their seat. There is no specific indication of valve position. [The operator can get indication, when in manual, as to the signal sent to the valve set by looking at the meter directly above the T switch. This would let the operator know if a slow speed or fast speed signal was sent when the switch was toggled. Also, you can assume the first group is fully open with the light for the second group goes on and so on.]

Two CRs have been written recently on the steam dump controller due to oscillations problems that occurred when in automatic. During the last startup the operators had to shift to manual for a period of time due to erratic automatic operation. CR 199907799 was written which said: At 4% reactor power the HP steam dump Foxboro controller n the CCR on panel FCF controls erratically in automatic. During the start up control of the steam dumps in auto caused steam generator level deviations. When control was switched to manual, much better control was obtained and steam generator deviations ceased. During the event CR 200001315 was written which said: High pressure steam dumps controller opened and closed about 25% at a time controlling pressure in "batches" not responding properly. Controller was placed in manual.

Discussions with an operator in the control room (Dave) indicate that automatic is the normal mode of operation and would be used during cooldown also if the controller wasn't erratic. Whenever the automatic operation gets erratic the operators shift to manual to stabilize plant conditions. This is allowed by procedure.

3/1/00, 1500, Control Room Operator (Dave) - Steam Generators

Operator does not think the Proteus computer level for the SG is the best indication. They use the wide range (3 per SG) and narrow range level indication in the control room. The narrow range overlaps the top 25% of the wide range indication.

The #24 SG level stayed at ~ 91% for over 5 hours. The level was really above the top tap (100%) but only read 91% because of wide range level is calibrated cold (70 F) and the narrow range is calibrated hot (540 F). This causes the NR to read high and the WR to read low when at the temperatures that existed in the SG at the time the WR level read 91% for over 5 hours. So SG level was above 100% and rising even though the level indicator said 91%.

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EQUIPMENT ISSUES

	Equipment Issue	Cond. Report 2000-	Lead	Comments
1.	Pressurizer pressure master controller did not control (close) when required in automatic? Operators took manual control.	1137	Dave M	This happened a year ago also and may be a recurring problem.
2.	Steam dumps to the condenser did not modulate in automatic. When operating in automatic during the event they did not move smoothly but jumped in 25% increments so the operator shifted to the manual mode.	1215	**Greg H**	Determine how the valve controller works. See statements above.
3.	CVCS letdown back pressure regulator slammed shut vice throttling.		Warr en	
4.	Why did condenser vacuum get lost several times?	0984	Craig	
5.	RCS over pressure protection system inoperative due to inadequate N2 supply to PORVs	1025	L	
6.	Isolation valve seal water system	1026 1033	Dave M+	
7.	VC sump pumps isolated on SI	1037	L	
8.	21 RCP high vibration on starting 2nd charging pump.	1137	**Greg M+**	**Still investigating.**
9.	23 RCP seal return < 0.26 gpm for 2 minutes.	1137	**Greg M+**	**Still investigating.**
10.	DMIMS alarm after securing 2nd RCP	1137	**Greg M+**	See comments in interview notes above.
11.	Ten status indication lights in control room (2 is true) fail to illuminate.	0997 0998 0999 1000 1007	L	

12.	SJAE discharge isolation valve was slow to close on CI 'A' signal. When were the 'hogger' and the mechanical vacuum pump run?	1008	**Greg L**	The mechanical vacuum pump was used to recover vacuum when the vacuum was lost after the trip. It was run until the steam jet air ejector was restarted. The steam 'hogger' is not used. The mech vacuum pump exhaust discharge to the exhaust vent after the R45 radiation monitor. The steam 'hogger' taps in before R45.
13.	Excess letdown CCW isolation valve 793 position light blowing fuses, no valve position indication available.	1023	L	
14.	Winterization of AFW pump room may cause room heat up during prolonged AFW operation affecting pump operability.	1051	Barry L	
15.	RHR temperature indication may be inaccurate. Computer T0630 (RHR pump discharge) = 198 °F RHR inlet temp (RAMS graph) ~ 190 °F	1065	Warr en H	This may impact actual Mode 4/5 control.
16.	Emergency Data Display System (EDDS) and Emergency Response Data System (ERDS) were inoperable for first 5 hours of the event.	1094	Nanc y M+	
17.	Reurter-Stokes offsite telemeter radiation monitor did not provide proper output during the event.	1095 1218	Nanc y M+	
18.	Surge line/aux spray line delta Ts may have been exceeded. 105°F in 47 minutes?		**Greg M**	Licensee is currently evaluating and will provide their conclusion before restart. Westinghouse involved.

19.	#24 SG wide range level inst stopped tracking level at 91%.		**Greg H**	**Why?**
20.	Review PCV-1137 calibration data to verify lift set point.		**Greg H**	Calibration data is OK.
21.	2/15 @ 1930, stuck control rod alarm. From alarm printout. @ 2001 rod C0001 shows 4 steps out.		**Greg** —	See comments above.
22.	The atmospheric dump valves of the #24 SG has a history of leaking. A W/O, P-99-10042, was written in July 1999 and the results indicated that the valve was not leaking.			
23.	Why was there a containment entry to reposition RHR valves?			To open drain valve on RHR supply to the Containment Spray header to ensure that a leaking RHR valve would not allow filling the CS header & spraying.
24.	Was there some Operating Experience from Westinghouse a few months before the event regarding the proper pressure to be able to go on RHR?			Yes.
25.	Potential SG code safety relief valve problems		**Greg M+**	See SL-1 team report
26.	Check on accuracy of pressurizer level.		Warr en	