

Decision Making at a Nuclear Power Facility

Part A. Harry, the Reluctant Maintenance Man

Harry opened his lunch bucket and was disappointed to find two tuna fish sandwiches again. "Damn," he muttered to himself, "four days in a row." He would have to get on his daughter, Susan, again. She graciously prepared his lunch most days but did not always provide the variety he liked. Of course, Susan would explain that she had other things to do besides providing him with a full lunch menu.

Across the cafeteria, Dan Thompson was eating with one of the design engineers, Marty Harris. Dan didn't like to talk shop while eating, but today had decided to continue a previous discussion over lunch. Dan was the supervisor of technical maintenance and had noticed that several of his people were reluctant to follow maintenance procedures. He had been told that the specifications were too complex to understand, that the procedures were often unnecessary, and that the plant engineers did not really appreciate maintenance problems. On the one hand, Dan realized that most of their complaints were just excuses for "doing things their own way." On the other hand, he didn't really know which procedures were important and which were not. That's why he had asked Marty to meet with him.

"Look, Dan," Marty was saying, "I know these procedures are complex. But damn it, nuclear power plants are complex—and potentially risky. Every specification, every procedure has a reason for being there. If your maintenance people ignore one procedure, they might get by with it and nothing happens. But one of them just might do it at the wrong time, and something could go haywire. You might explain that we have safety and cost to consider. If we lost expensive equipment, how'd they like to

pay for it? Not much, I bet. If they lose a finger or get exposed to too much radiation, they wouldn't like that either. Now, just tell your people that the specifications and procedures, if followed, are the guarantee that things won't go wrong. They can count on it. If they take shortcuts, I won't guarantee a thing."

Dan nodded. This really wasn't what his maintenance staff wanted. They had hoped for a little flexibility, but he was going to have to tell them to follow the procedures. They wouldn't like it, but they would have to do it.

Later that afternoon, Dan met with his unit and relayed the instructions. He reminded them of the rules and disciplinary actions for not following procedures. At the end of the meeting, he couldn't decide whether it had done any good.

On Thursday, Harry noticed that he had been assigned the routinely scheduled maintenance on the three auxiliary feedwater (AFW) pumps. These pumps were normally used only for startup and shutdown and as emergency backup. When the main feedwater system malfunctioned, these pumps would activate to keep the system from "drying out." The procedure also specified that the pumps should be serviced and tested one at a time and that, at most, one pump should be out of service at a time.

"That's horse manure," Harry thought. "Takes three hours to service the pumps that way. I can do it in two if I shut 'em down together. Two's better than three. Those stupid design people have probably never tried to service one of these things."

Harry didn't bother to open the manual for pump servicing. He had serviced these pumps several times in the past and felt no need to do it from the book any longer. He reached over and shut off three discharge valves, set out his equipment, and got to work. Two hours later he was done. He packed up his tools and hurried to get home.

Part B. System Breakdown

Marv Bradbury was working the graveyard shift. Most technicians didn't like this shift, but Marv didn't mind it at all. In fact, he thrived on it. Over the past few months, he had discovered that he enjoyed the solitude. He also liked to sleep in the mornings. Many of his co-workers thought he was nuts, but he didn't mind. He especially liked the extra responsibility that the graveyard shift put on the technician position.

Marv's job in the nuclear generating plant was particularly important. His primary job was to monitor a series of dials and readouts in the control room. Most of the time, the job was a little monotonous because the system was so automatic. However, if the readings indicated some variance in the system, Marv's responsibilities were great. He would have to interpret the readings, diagnose the problem, and—if the automatic correcting system failed—initiate corrective actions. For two reasons, Marv never worried about the enormous responsibilities of his job. First, the system was fault-free and self-correcting. It was a good system with no weaknesses. Second, Marv was exceptionally qualified and understood the system very well. He always knew what he had to do in the event of a problem and was capable of doing it. Several years of training had not been wasted on him.

It was about 4 a.m. when he noticed the feedwater dial reading begin to move rapidly. Temperature in the system was increasing quickly. The readings alerted Marv that the main system was malfunctioning, and he knew just what to do. He glanced over to the AFW indicator lights to be sure they were activated. The lights switched on, and he knew everything was in order. Obviously, he would have to find the malfunction in the main system, but for the time being everything was okay. The

temperature in the cooling system should drop back down to normal as the AFW pumps took over.

Suddenly, the indicator light for the pressurizer relief valve showed that it had opened. In rapid succession the high reactor tripped, and the hot leg temperature in the primary loop increased to about 607 degrees Fahrenheit.

Marv knew the system was in severe trouble and got on the phone to get help. Before he could get back, the high-pressure injection pump had started, and he could feel an unusual and threatening vibration that shouldn't be there. Indicators showed that the steam generators were drying out, but that didn't make sense—the auxiliaries were running. He knew that if they dried out, the temperature was really going to go up and that the core was going to be damaged. "Why the hell isn't that secondary loop running?" he yelled to himself.

It took eight minutes to get someone down to the auxiliary pump room and discover that the three valves were still closed. They opened the valves, but it was too late. Now no one seemed to know what to do.

Discussion Questions

1. Analyze the critical problem in Part A of the case. Did Dan handle it in the best way? Which decision approach did he use?
2. In what important ways is Harry's behavior different from Marv's?
3. How might group decision making be applied at the end of Part B?
4. What alternatives do you see for reducing the possibility of a similar problem in the future?