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Union of Concerned Scientists

December 7, 2000

Mr. Hubert J. Miller, Regional Administrator
United States Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406-1415

SUBJECT: QUESTIONS ABOUT REPORT ON SCRAM AT NINE MILE POINT UNIT 1

Dear Mr. Miller:

By letter dated October 27, 2000, Niagara Mohawk submitted a licensee event report (LER) on the reactor scram that occurred at Nine Mile Point Unit 1 on September 27, 2000. The LER states that the plant was already shut down when the water level inside the reactor pressure vessel dropped below the automatic scram setpoint as operators were placing the reactor water cleanup system in service. The LER states:

> During the initial three minutes after restoring the reactor water cleanup system [to service], reactor level dropped from approximately 66 to 49.5 inches [above instrument zero]. In the following four minutes, operators stabilized reactor water level at approximately 55 inches. A standby reactor water cleanup filter that was drained and isolated prior to placing the reactor water cleanup system in service was found filled after the reactor trip. The standby reactor water cleanup filter isolation valves leaked allowing reactor water to fill the drained standby filter and associated piping. The volume of the drained standby filter and associated piping is approximately the same volume as the reactor water level reduction experienced when the reactor water cleanup system was placed in service.

Niagara Mohawk reported that the water level inside the reactor pressure vessel dropped 16.5-inches in just three minutes during the event. The Plant Information Book material from the NRC's website specifies that the reactor pressure vessel at Nine Mile Point Unit 1 has an inside diameter of 17 feet, 9 inches. If one excludes all internal components, that diameter provides a volume of approximately 20.62 cubic feet per vertical inch along the reactor pressure vessel. At standard temperature and pressure, that volume equates to approximately 154 gallons of water per vertical inch along the reactor pressure vessel. The 16.5-inch level drop represented, at most, the loss of 2,541 gallons. Considering that the drop occurred over a three-minute period, that represented a net outflow of 847 gallons per minute.

The actual flow rate during the event was undoubtedly less than 847 gallons per minute because (a) there are internal components which reduce the volume per vertical inch value and (b) the reactor, although shut down, was probably at greater than standard temperature and pressure conditions. Even if the actual flow loss through the reactor water cleanup system was about 10 percent of the 847 gallons per minute, it still means that over 100 gallons per minute were lost to the system during those three minutes.

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Niagara Mohawk attributed the water loss to "standby reactor water cleanup filter isolation valves [that] leaked allowing reactor water to fill the drained standby filter and associated piping." I was unable to find the reactor water cleanup system flow rate during normal operation of Nine Mile Point Unit 1, but I believe that it is less than 847 gallons per minute. I believe that the system flow rate is closer to 100 gallons per minute than 847 gallons per minute. Thus, it appears that the so-called "leakage" past the purportedly closed isolation valves in the reactor water cleanup system allowed a flow rate approximating that of the system during normal operation (i.e., when the valves are wide open).

The LER states that the event was caused by "inadequate filling and venting of the reactor water cleanup system." The rapid draindown of the reactor pressure vessel into the incompletely filled reactor water cleanup system produce the conditions that have caused water hammer damage in the past, yet the LER does not indicate that any piping or piping supports were examined for water hammer effects. The NRC notified Niagara Mohawk of water hammer risk with Information Notice 91-50[1] and Information Notice 91-50 Supplement 1.[2] The NRC notified Niagara Mohawk about actual events at nuclear power plants where piping and/or supports were damaged by water hammers caused by improper venting and filling. Niagara Mohawk seems not to have heeded these alerts, at least for the reactor water cleanup system.

The LER also states:

> During this event, operators were controlling reactor water level with the control rod drive system. Historically when placing the reactor water cleanup in service, operators have used systems (i.e. condensate system) that have greater makeup capability than the control rod drive system. Previously, during this evolution, with the additional makeup capability, the operators noted an approximately 4-inch reactor water level drop.

It is my understanding that the control rod drive system provides a constant, though manually adjustable, flow rate to the reactor pressure vessel. In other words, when water level inside the reactor pressure vessel increases or decreases, the operator must manually adjust control rod drive system flow to compensate for it.

It is my understanding that the condensate system, except in rare moments of manual control, provides a flow rate to the reactor pressure vessel dependent on a specified level setpoint. In other words, when the water level inside the reactor pressure vessel increases or decreases, the control system automatically adjusts condensate system flow to maintain the specified level setpoint.

If the condensate system had been in service under automatic control during the September 27, 2000, event as it apparently had been for prior events, the condensate system flow would have automatically increased as soon as the water level inside the reactor pressure vessel dropped below the setpoint. That automatic flow adjustment might have limited the level drop to the 4-inches observed during prior events.

Therefore, it appears credible that the 16.5-inch level drop in the September 27, 2000, event was <u>not</u> caused by leakage past closed isolation valves as postulated by Niagara Mohawk but rather by reactor water filling the reactor water cleanup system piping as in past events. The difference this time was that the condensate system did not automatically step in to cover the operators' mistake as in the past. The whole standby reactor water cleanup filter thing is most likely a red herring invented by the company to make the operators performance problems less irksome to the NRC.

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[1] http://www.nrc.gov/NRC/GENACT/GC/IN/1991/in91050.txt

[2] http://www.nrc.gov/NRC/GENACT/GC/IN/1991/in91050s1.txt

Niagara Mohawk's explanation for the September 27, 2000, event at Nine Mile Point Unit 1 is superficial. The following questions were not answered, at least in the LER that the company submitted to the NRC:

1. How much water really found its way to the standby reactor water cleanup system filter in the first three minutes of the event?

2. Were the isolation valves for the standby reactor water cleanup system filter closed?

3. If the isolation valves were closed, what was the leakage rate past them to fill the volume of the standby reactor water cleanup system filter in only three minutes?

4. Was the reactor water cleanup system piping and associated supports inspected for damage caused by water-hammer?

5. Why don't the Corrective Actions undertaken by Niagara Mohawk include at least an audit of operational experience review (e.g., NRC Information Notices, GE Service Information Letters, et al) to ensure that all appropriate actions have been taken at Nine Mile Point Unit 1?

Instead of NRC providing me with the answers to these questions, I'd prefer it if the NRC required or requested Niagara Mohawk to provide formal answers to NRC. A revision to the LER incorporating the answers seems warranted.

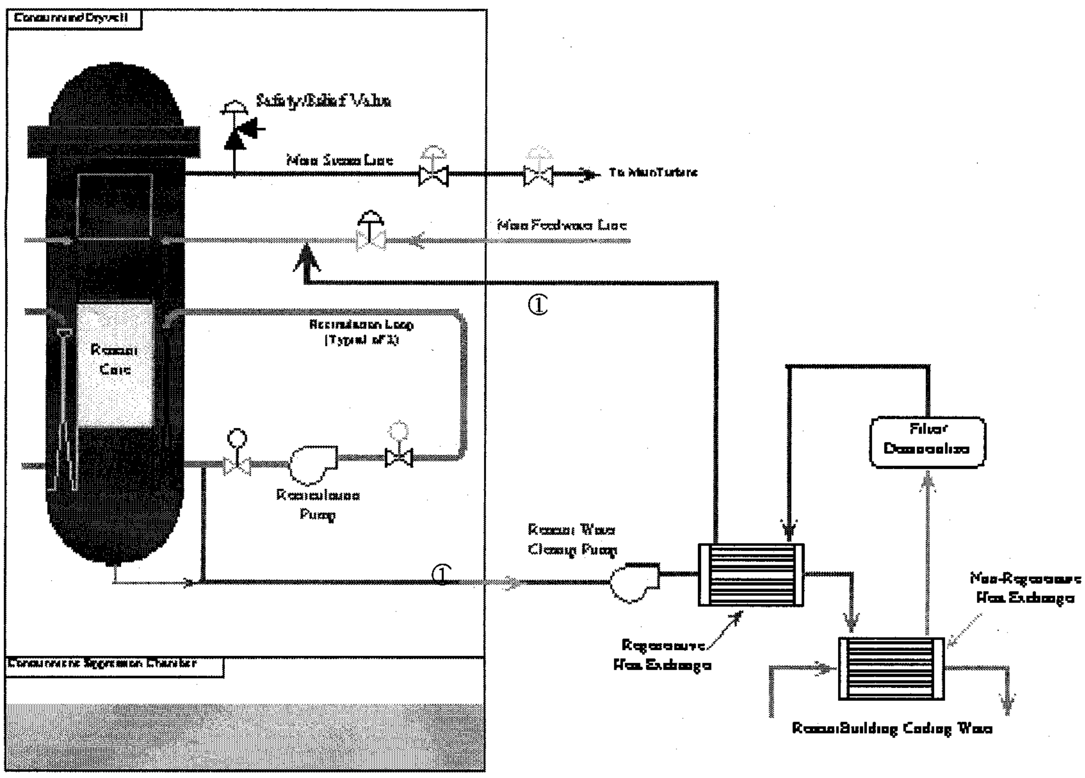
Sincerely,

David A. Lochbaum

David A. Lochbaum
Nuclear Safety Engineer
Union of Concerned Scientists

Attachment 1
Reactor Water Cleanup System Background

The reactor water cleanup system functions to control the chemistry of the water in the reactor pressure vessel to retard corrosion of the reactor pressure vessel metal and internal components. The reactor water chemistry is also controlled to promote heat transfer from the nuclear fuel rods to the water.



Source: Nuclear Regulatory Commission

Reactor water is sent by the reactor water cleanup pump through a series of heat exchangers that cool the water from approximately 510°F to less than 140°F. The cooled water is then routed through a filter/demineralizer unit that removes suspended particles and dissolved ions. The cooler, cleaner water passes back through a heat exchanger, this time to warm it up to around 400°F. The warmer, cleaner water is discharged into the feedwater piping and returned to the reactor pressure vessel.

During the event at Nine Mile Point Unit 1, operators opened valves (shown as ① in the diagram) to return the reactor water cleanup system to service. Because the system piping had not first been filled with water, opening the valves drained water from the reactor pressure vessel to the reactor water cleanup system piping. The resulting level drop inside the reactor pressure vessel caused an automatic reactor scram.