July 1, 1981

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of PENNSYLVANIA POWER & LIGHT COMPANY and ALLEGHENY ELECTRIC COOPERATIVE, INC. (Susquehanna Steam Electric Station, Units 1 and 2)	Docket Nos. 50-387 50-388

APPLICANTS' STATEMENT OF MATERIAL FACTS AS TO WHICH THERE IS NO GENUINE ISSUE TO BE HEARD (CONTENTION 19)

Pursuant to 10 C.F.R. § 2.749(a) Applicants state, in support of their Motion for Summary Disposition of Contention 19 in this proceeding, that there is no genuine issue to be heard with respect to the following material facts:

1. The accident at the Three Mile Island Unit 2 facility ("TMI-2"), which is the subject of Contention 19, began with a loss of feedwater and unavailability of auxiliary feedwater which combined to deprive the reactor of its heat sink. The Mark-II containment design used in the Susquehanna units has a large suppression pool inside the containment which provides a passive heat sink for primary system energy during a loss of coolant accident. This heat sink capacity is sufficient to accommodate decay heat from the reactor for several hours with the reactor isolated from its normal

heat sink. This provides the operator with ample time to establish active containment cooling following a loss of coolant accident. Thus, the occurrence at Susquehanna of the crucial initiating event of the TMI accident is very improbable. Affidavit of Junius William Millard In Support of Summary Disposition of Contention 19 ("Millard Aff."), para. 4,.

2. The TMI-2 event became a small break LOCA when a power operated primary relief valve stuck open, leading to the overpressurization of its quench tank, discharge of primary system water to the containment, and activation of the emergency core cooling system. Susquehanna has safety relief valves ("SRVs") which are designed to open to relieve pressure increases that occur during expected transients and during certain accident conditions. Each SRV is piped to the large suppression pool. Millard Aff., para. 5.

3. The containment at Susquehanna is not pressurized by SRV blowdown and the normal makeup system maintains the reactor water level without initiation of emergency core cooling systems (ECCS). If an SRV were to stick open, the reactor would begin to depressurize due to the loss of steam out of the reactor vessel. Within a few seconds after the start of such a depressurization transient, the turbine control valve would close, and the reactor vessel pressure would stabilize. Ample time would be available for corrective action to be taken by the operator. In short, there are no TMI-type complications arising from SRV actuation and subsequent failure to close; such an event would be only a minor transient at Susquehanna. Id., para. 5.

4. The TMI-2 operators were misled into believing that the reactor core was sufficiently covered due to their relying on the pressurizer level to give an indirect (and ambiguous) measure of the water level in the reactor. At Susquehanna, however, the water level in the reactor vessel is measured continuously and directly using differential pressure cells. The reactor water level is also displayed redundantly in the control room at the reactor control console in full view of the operator. Id., para. 6.

5. The TMI-2 operators did not recognize and therefore did not respond promptly to the existence of boiling in the reactor. Boiling, however, is the normal mode of BWR operation. Water is circulated directly through the reactor core where it boils to produce saturated steam which is separated from recirculation water, dried in the top of the vessel, and directed to the steam turbine generator. Therefore, since boiling is normal in BWRs, there is no problem requiring operator action resulting from boiling. Id., para. 7.

6. The noncondensible gases trapped in the TMI-2 reactor vessel could not be vented and inhibited natural circulation cooling. The Susquehanna vessel can be vented either through the SRVs or through a vessel dome vent line. Any noncondensibles formed in the BWR rise to the top of the vessel by virtue of the same phenomena and by the same route as the steam that is generated in the core. During reactor shutdown conditions, noncondensibles are swept with the steam either to the condenser (via the turbine bypass valve) or to the suppression pool (via the SRVs). The reactor vessel head can also be vented to the drywell remotely from the control room. Whether or not noncondensibles are vented from the top of the vessel, the formation of noncondensibles will not hinder natural circulation

during an abnormal event, nor will it result in a blockage condition that could hamper eventual recovery of the core. Id., para 8.

7. Natural circulation at TMI-2 was interrupted by voids resulting from boiling and noncondensible gases trapped in the primary system. Neither boiling nor non-condensible gases are obstacles to natural circulation at Susquehanna. Moreover, strong natural circulation internal to the reactor vessel is a significant inherent feature of the Susquehanna reactors, which are capable of operating at significant power under natural circulation conditions while retaining core cooling margins. Id., para. 9.

8. The primary natural circulation loop at Susquehanna is between the downcomer and the core. This natural circulation flow is established by boiling in the core region which causes a large difference in coolant density. This density difference becomes the driving force for natural circulation flow from the downcomer through the jet pumps and into the shroud region. Id., para. 10.

9. A second natural circulation loop also exists as an internal loop between the fluid in the bypass region and in the boiling region within the active fuel. Again driven by the density difference between these two regions, this natural circulation causes water to flow downward through the bypass and into the bottom of the active fuel bundles through the normal bypass leakage paths. Un-evaporated water is recirculated to the bypass region at the top and the difference is made up from the water inventory in the upper plenum. Thus, a second natural water circulation through the active core is maintained as long as water inventory in the upper plenum is not depleted. Id., para. 11.

10. With the reactor shut down, these natural circulation mechanisms provide adequate core cooling as long as the core is covered. For an accident of the type experienced at TMI-2, maintenance of natural circulation at the Susquehanna units would occur automatically and would not require operator action. Id., para. 12.

11. The TMI-2 reactor was maintained partially pressurized following the accident because of concern over boiling in the reactor and possible core uncovery due to expansion of the noncondensible gas bubble. Since the Susquehanna units are designed for boiling and have provision for venting of noncondensible gases, they can be safely depressurized during an emergency. Rapid depressurization through the SRVs to the suppression pool can be initiated either automatically or manually. Id., para. 13.

12. Partial uncovering of the core at TMI-2 led to inadequate core cooling and resulted in core damage. The Susquehanna reactors are designed with a multiplicity of water sources and injection delivery systems to maintain adequate core cooling. The diverse and redundant water supply capability to the Susquehanna reactor vessels is partly due to the direct cycle BWR design in which normal pumping systems (feedwater, control rod drive cooling, and reactor core isolation cooling (RCIC)), provide makeup water to the reactor vessel. In addition, the emergency core cooling system (ECCS) assures adequate cooling during an emergency via high pressure core injection (HPCI), low pressure coolant injection (LPCI), or low pressure core spray (LPCS). These systems include the capability to spray the core from above and refill it from below at both high and low pressure. Id., para. 14.

13. RCIC is initiated automatically when the water level in the reactor vessel drops below a preselected level. RCIC supplies makeup water from the condensate storage tank (primary source), the suppression pool or, following manual operator action, from the steam condensed in the residual heat removal system (RHR) heat exchangers. Through these sources, RCIC maintains sufficient makeup water in the vessel to cool the core. It then maintains the reactor in safe standby condition or allows for complete plant shutdown. Id., para. 15.

14. HPCI is a high pressure system designed to provide makeup water in the event of loss of reactor coolant inventory. The system permits the plant to shut down while maintaining sufficient reactor vessel water inventory until the reactor vessel is depressurized. Operation of the system is automatically initiated from signals indicating low reactor water level or high drywell pressure. The HPCI pump initially draws water from the condensate storage tank and automatically switches to the suppression pool with condensate tank low water level indication or when the high suppression pool water level is reached. For Susquehanna, the HPCI injection valve will close on a high reactor water level signal and will reopen if another low water level signal is received. Id., para. 16.

15. LPCI is a low pressure system designed to restore and maintain the water level in the reactor vessel after a LOCA so that the core is sufficiently cooled to prevent fuel cladding heat up. The LPCI pumps are initiated by either 1) high drywell pressure when reactor pressure is low or 2) low reactor water level. This reduction in reactor pressure may be caused by the break itself,

or by the initiation of the automatic depressurization system or a combination of both. Water is supplied to the vessel from the suppression pool. Id., para. 17.

16. LPCS is a second low pressure system designed to prevent fuel cladding heat up in the event the core is uncovered by a loss-of-coolant accident. The cooling is accomplished by directing jets of water over the fuel assemblies from spray nozzles mounted on a ring above the reactor core. The LPCS is initiated on low reactor water level, or high drywell pressure when the reactor pressure is low. Water is supplied to the vessel from the suppression pool. The system continues to operate until it is manually stopped by the operator. Id., para. 18.

17. These systems (HPCI, RCIC, LPCI, LPCS) together with the inherent natural circulation, provide adequate decay heat removal capability. Id., para. 19.

18. TMI-2 released radiation to the environment because there were incomplete containment isolation and containment bypass leakage. The Susquehanna units are designed so that primary containment isolates at the same time the emergency core cooling systems are initiated. All systems which are not required for accident mitigation are provided with two isolation valves in series on each line penetrating the primary containment. Both valves are actuated upon an isolation signal. Containment isolation is accomplished by safety grade instrumentation, actuators and valves. Reopening any isolation valve requires specific operator action. Id., para. 20.

19. The Susquehanna units have been designed with a pressure suppression system within containment to absorb the energy and radioactivity released during an accident. The primary containment itself is conservatively designed to withstand applied

loads which may result from an accident. The drywell, which is the upper portion of the primary containment, is connected to the pressure suppression pool and channels the air-steam mixture released during an accident to the suppression pool. Id., para. 21.

20. The suppression pool serves as an effective second barrier to radioactive releases. A process of decontamination takes place at the pool by "scrubbing" steam or fluid releases from the primary coolant system and reducing their content of radioactive materials. For postulated events which lead to radioactivity releases, the decontamination factor is in the range of 100 to 1000. Any radioactive matter that passes through the suppression pool or remains in the drywell is contained by the primary containment. Id., para. 22.

21. Within primary and secondary containment are those systems which process primary coolant and containment radioactive materials and are required to operate in the event of a LOCA. All leakage from the primary containment or through containment penetrations, or from emergency core cooling systems, goes into the secondary containment, which encloses the primary containment. Radioactive materials are prevented from direct release to the outside environment since the secondary containment volume is maintained at a negative pressure during accident conditions by the Standby Gas Treatment System ("SGTS"). The SGTS is safety grade and includes high efficiency filters, so that gaseous discharges from the secondary containment to the outside environment would be filtered and the radioactive material concentration substantially reduced. The secondary containment provides, therefore, a third barrier against, and further reduction factors and dilution of, all radioactive releases. The Susquehanna containment design thus

provides a multiple barrier approach for retention and control of radioactive material releases in the event of an accident. Id., para. 23.

22. The TMI accident can be described as a small break loss of coolant accident ("LOCA") which was not recognized by the plant operators, and which was complicated by a series of equipment failures and operator errors which combined to provide severe damage to the plant. Id., para. 3. The design and operation of the Susquehanna units are such that a TMI-2 type accident is very unlikely to occur at Susquehanna. Id., para. 2.

23. Even if one or more of the events in the TMI-2 sequence occurred during operation of the Susquehanna units, their design capability is sufficient to successfully mitigate the consequences and prevent significant radiation releases. Id., para. 3.

Dated: July 1, 1981.

Respectfully submitted,

SHAW, PITTMAN, POTTS & TROWBRIDGE

Jay E. Silberg

Jay E. Silberg
Matias F. Travieso-Diaz

Counsel for Applicants

1800 M Street, N.W.
Washington, D. C. 20036
(202) 822-1000