UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

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

AFFIDAVIT OF STEVEN H. CANTONE

County of Lehigh	)	
	)	ss:
Commonwealth of Pennsylvania	)	

Steven H. Cantone, being duly sworn according to law, deposes and says as follows:

1. I am Manager - Nuclear Support, Pennsylvania Power & Light Company, and give this Affidavit to support the Stipulation of Withdrawal of Exceptions. I have personal knowledge of the matters set forth herein and believe them to be true and correct. A summary of my professional qualifications and experience is attached as Exhibit "A" hereto.

2. The Commonwealth of Pennsylvania and Luzerne and Columbia County emergency plans currently call for each emergency worker to receive 3 types of personal dosimetry:

a. CDV-742 (self-reading, 0-200 R);

b. CDV-730 (self-reading, 0-20 R); and

c. Thermoluminescent dosimeter (TLD) (permanent record).

At the present time, the Commonwealth has enough CDV-742's to supply each emergency worker with his own. (The Commonwealth has an inventory of 112,872 CDV-742's,1/ enough to supply every emergency worker in the state with several of these dosimeters). Neither the Commonwealth nor the counties have enough CDV-730's or TLD's to supply each emergency worker.

3. In consideration of many factors, including the legislation pending in the Pennsylvania legislature concerning payments by utilities for emergency planning costs, Applicants have agreed to supply funds for the Commonwealth to obtain 3192 TLD's and 2500 CDV-730's (or equivalent). Applicants believe that this dosimetry, in conjunction with the existing stocks of CDV-742's, will provide more than adequate personnel dosimetry for emergency workers who might be involved in the event of an accident at the Susquehanna facility. A copy of the Stipulation between the Commonwealth and Applicants is being filed separately.

1/ Memo from Walter P. Pierson, Chief, Natural and Technological Hazards Division, Region III, FEMA, to Richard K. Krimm, Assistant Associate Director, Office of Natural and Technological Hazards, FEMA, "Request by the Commonwealth of Pennsylvania for Radiological Emergency Preparedness (REP) Dosimetry Equipment Assistance and Guidance on FEMA-REP-2", dated August 21, 1982. (A copy of which is attached as Exhibit B hereto.)

4. The Stipulation provides for fewer CDV-730's than TLD's. This is appropriate since CDV-730's can be used sequentially by more than one emergency worker while a TLD cannot. The total number of available emergency workers would not need dosimetry at the same time (considering multiple shifts, etc.). CDV-730's can be "zeroed" whenever personnel leave the EPZ and reassigned to entering personnel. The number of CDV-730's will be more than enough to cover all emergency workers likely to need dosimetry at any one time.

5. The 3192 TLD's should be readily available. PP&L expects that the Commonwealth will be able to obtain these within 2 weeks.

6. CDV-730's are not readily available in the desired quantities. These dosimeters are available from 3 suppliers. William B. Johnson & Associates (which supplies a French-manufactured device) estimates that an initial delivery of CDV-730's could be furnished within 3 months, with completion of deliveries within 6 months. Dosimeter Corporation has stated that an initial delivery of 500 would be available in 4 months, with additional shipments of 500 per month thereafter. Baird Corporation has estimated that an initial delivery of CDV-730's would be available within 60-90 days, with deliveries completed in about 180 days. There are no known stockpiles of CDV-730's. Therefore, it is estimated to be 6-9 months before enough CDV-730's could be supplied. To

the extent that other utilities or jurisdictions are also seeking to purchase CDV-730's, the delay could become even longer.

7. Notwithstanding the absence of CDV-730's in quantities sufficient to meet the numbers identified in the Commonwealth and county plans, the health and safety of emergency workers would be adequately protected in the unlikely event that an accident should occur during this period. Although it would be preferable to have sufficient CDV-730's, they are not necessary to provide reasonable assurance that adequate protective actions can be taken for emergency workers within the plume exposure EPZ.

8. It should first be pointed out that the risk during this interim period is very low because the period of time is relatively short.

9. In addition, for the interim period, adequate self-reading dosimetry exists even if supplies of CDV-730's and TLD's are currently unavailable. CDV-742's distributed to each emergency worker would give the worker the ability to detect doses well below levels at which he needs to take protective action. This, together with other compensatory measures identified below, provides adequate protection for emergency workers.

10. The protective action guide for emergency workers is 25 rem. The Commonwealth and county plans call for an

emergency worker to seek replacement or complete the assigned task and then evacuate to a mass care/decontamination center when his self-reading dosimetry indicates a total dose in the 15 to 20 rem range. The CDV-742 can readily provide this information.

11. FEMA has stated that

a. the CDV-742 can be accurately read in the dose range far below the maximum emergency worker PAG;

b. the CDV-742 can be substituted for the CDV-730 where there are shortages; and

c. if a CDV-742 is assigned to an individual and remains with him throughout the duration of the emergency, then the CDV-742 is adequate for a self-reading dosimetric device.

See FEMA Memo, note 1 above. FEMA has also observed that the range of the CDV-742 is from 4 to 200 R.2/

12. PP&L has tested a number of CDV-742's to confirm their accuracy. Fifteen CDV-742's were tested by William B. Johnson & Associates. The dosimeters were exposed to a Radium-226 source with a calibrated dose rate of 300 mR/hr for periods of 23 and 79 hours. At an exposure of 6.9 R, the average reading of the CDV-742's was 7.1 R, with a standard deviation of 1.5 R. At an exposure of 23.7 R, the average

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2/ FEMA-REP-2, "Guidance on Offsite Emergency Radiation Measurement Systems -- Phase 1 -- Airborne Release" (September 1980) at 5-8.

reading was 22.2 R, with a standard deviation of 3.3 R. A second sample of 21 CDV-742's, 19 from the Columbia County supply and 2 from PP&L, was tested by Rad Services Incorporated. This testing involved exposure to a calibrated Cobalt-60 source with a 48.71 R/hr dose rate for successive intervals of 6.61 minutes. The dosimeters were irradiated to doses of 5, 10, 15, 20 and 25 R. These dosimeters were found to be accurate within a range of ± 10%. Although the number of dosimeters tested is relatively small, these tests confirm FEMA's judgment on the usefulness of the CDV-742's.

13. While readings for doses below 10 R are less exact than those above 10 R, a reading of 5 R on the CDV-742 is easily discernible. A reading of 25 R is one-eighth of a full-scale reading. Thus, emergency workers would be able to determine their doses at levels well below the action levels specified in the emergency plans.

14. Assurance of the CDV-742's adequacy is also found in its conservative nature. If it should fail, it will fail in a conservative direction, showing higher doses than actually exist.3/ When a CDV-742 is charged and set at zero, an electric charge is placed on a quartz fiber within the dosimeter. Radiation exposure reduces the charge and a visual scale calibrated for exposure indicates the total radiation received.

3/ Cember, Introduction to Health Physics, p. 247 (Pergamon Press 1969).

Failure modes involve a leak of the electrical charge. This can be caused by spurious discharge from physical shock, or by dirt or moisture within the dosimeter from damage to the hermetic seal. The leakage of the electric charge would cause the dosimeter to show a greater dose than occurred, leading emergency workers to take protective actions earlier than actually necessary.

15. In addition to the CDV-742's, PP&L's dose assessment and evaluation system would be available to provide accurate and timely dose information to emergency workers. This constitutes an important compensatory measure.

16. PP&L uses several methods to provide quick and accurate estimates of off-site doses in the event of an accident. Off-site doses would be calculated by one of three methods. Total accumulated doses are updated every 15 minutes for a variety of locations. Field measurements will be taken, starting at the site boundary, and at various locations within the plume exposure pathway. Correlation between the field readings and the calculated values provides an accurate assessment of the current dose rate, the integrated dose, and the total projected dose. The dose assessments are used, in conjunction with other factors, to recommend protective actions. Dose assessment is also performed by the Commonwealth's Department of Environmental Resources/Bureau of Radiological Protection (DER/BRP).

17. The three dose calculation methodologies are detailed in Emergency Plan Implementing Procedure EP-IP-009. The primary calculational method uses the RADDOSE computer code and the plant computer system. The code uses radioactivity release data from the gaseous effluent monitors at each plant vent and meteorological information from either of the two meteorological towers. Terminals with access to the RADDOSE program are located in the control room, Technical Support Center and Emergency Operations Facility. RADDOSE allows for both real time analysis and predictions based on postulated changes in plant conditions, meteorology, etc. Using atmospheric transfer and diffusion factors which account for site specific terrain and local climatological effects, RADDOSE can provide data on the plume dimensions and positions, and the location, magnitude, and arrival time of the plume at particular locations. On demand or on a periodic basis (minimum 10 minute intervals) the program calculates doses for a maximum of 24 distances in each of the 16 meteorological sectors and a maximum of 21 additional specific locations. RADDOSE also has the ability to calculate the time until the dose at a given location exceeds the given PAG levels. In the event the source release term is unknown, field measurements in dose rates or concentrations of activity from known locations and times can be used as input to RADDOSE to predict the source term and subsequently predict the doses at other off-site locations. In

this mode, RADDOSE can correlate field readings with calculated doses for a monitored release.

18. A backup method to RADDOSE involves the use of portable minicomputers (SHARP PC 1211) with the MET 1 or MET 2 computer programs. MET 1 and MET 2 calculate the centerline, whole body and thyroid dose rates. Using atmospheric diffusion data based on stability class, the MET 1 program provides data on the location, magnitude, and arrival time of the plume at appropriate locations. The MET 2 program, like RADDOSE, uses field monitoring data to calculate noble gas or iodine source terms in the event of an unmonitored release or to verify dose calculations for a monitored release. Due to the inability to compensate for site specific terrain features and local climatological effects, the minicomputers are generally not used for dose calculations beyond 1.5 miles from the plant for very stable meteorological conditions.

19. The third dose calculation method is a manual method using prepared dose isopleth overlays. The overlays use predetermined values for wind speed, gamma energy, release rate, breathing rate, and dose conversion factor. Correction factors can be applied to the normalized values to reflect the characteristics of the actual release. The appropriate isopleth is overlaid on the map of the 10 mile EPZ to portray the plume and its direction of travel. The overlay method can be used to calculate whole body and thyroid dose rates at any

location beyond 1.5 miles from the facility. Overlays which reflect terrain effects are available where meteorological conditions warrant. Like RADDOSE and MET 2, the overlay method can backcalculate a source term from field data.

20. To verify the calculated doses, PP&L has available off-site emergency monitoring teams. In the event of an accident, at least 5 (and up to 10) monitoring teams are dispatched. At the present, 35 team members have been fully trained. Each two-member team is equipped with an Eberline RO2 dose rate meter, a Ludlum 2218 Dual Channel Analyzer, and a low-volume air sampler. The team is provided with a four-wheel drive vehicle and is in direct radio contact with the TSC or EOF. Each team would generally make dose rate measurements every 20 minutes, but whole body dose rate measurements can be made continuously. All off-site monitoring data is recorded in either the TSC or EOF and used to verify the dose calculations. Should a difference occur, the monitoring data is used to generate a new source term.

21. Dose information and field monitoring data can be transmitted over a reliable communication system. The system is described in the Commonwealth's emergency plan (Annex E, Appendix 6) and the Luzerne and Columbia County plans (Annexes B, E and F).

22. Dose information (current dose rate, integrated doses, and projected doses) is transmitted by PP&L to DER/BRP

every 30 minutes, with more frequent updates as necessary. This communications link uses a dedicated, hard-wired telephone "hotline" with a backup radio system through the counties. The communications from DER/BRP would then go to PEMA via dedicated, hard-wired telephone "hotlines", also with a backup radio link. From PEMA, dose information would be communicated to Luzerne and Columbia counties, also using dedicated "hotlines". Backup methods to this communications link include dedicated teletype circuits, Radio Amateur Civil Emergency Services ("RACES"), and commercial telephone. (If necessary, PP&L can communicate directly with the counties through hotlines and backup radio systems.) Communications to municipalities would be by commercial telephone and the RACES network.

23. Communication to emergency workers would typically be from the counties. (Berwick fire, police and ambulance personnel are normally controlled by the Berwick EOC, but can be monitored and controlled by Columbia County.) Both Columbia and Luzerne have a Communications Center Radio Network comprised of the police, fire and ambulance radio networks. Emergency workers as defined in the county and municipal plans are predominantly fire, police and ambulance personnel and would thus be on the radio network. Volunteers or auxiliary police in rural areas typically have CB radios or police vehicle monitors patrolling the area with the ability of rapid dissemination of information. CB messages can be dispatched

and monitored by the county communications centers as well as by RACES operators.

24. The dedicated telephone portion of the system is tested monthly. The police, fire and ambulance radio networks are in normal 24-hour-a-day operation, and RACES capability is on normal operational standby and is tested at least annually. The communications system was tested in the March 1982 full-scale emergency drill and functioned properly.

25. With this communications system, dose information needed to protect the health and safety of emergency workers can be rapidly and reliably communicated to those workers should the need arise.

26. Since PP&L's dose assessment system involves the projection of future doses as well as the ascertainment of prior doses, the means exist to advise emergency workers long before their doses would reach the 15-20 rem range.

27. Therefore, notwithstanding the absence of TLD's and CDV-730's for the interim period, adequate dosimetry exists to protect the health and safety of emergency workers.

STEVEN H. CAUTOIS

Sworn to and subscribed
before me this 9th day
of September, 1982.

Steven H. Cantone

Education

Bachelor of Engineering -- Stevens Institute of Technology (1963)

Experience

1979-present -- Pennsylvania Power & Light Company, Manager-Nuclear Support. Responsible for radiological and environmental services, operational and maintenance support services, and project management of Susquehanna retrofit program. Radiological and environmental services responsibilities include off-site dose projections, environmental monitoring and emergency planning activities.

1976-1979 -- Power Authority of the State of New York, Superintendent of Power. Responsible for the functional operation of the Indian Point III Nuclear Power Plant, a 3,025 MWt pressurized water reactor plant, through direction of all operations, maintenance, instrumentation and controls, health physics, chemistry, site engineering and regulatory reporting activities. Emergency planning, outage management and development and implementation of material procurement and budgetary controls were also responsibilities of this position.

1963-1976 -- Consolidated Edison Company of New York. Positions of increasing responsibility starting from cadet engineer and ending with chief operations engineer of the Indian Point Nuclear Power Station. Responsibilities traversed the following functional areas: operator training, refueling supervision, power plant performance, procedure preparation, emergency planning, system chemistry and power plant operations.

Professional Credits

American Nuclear Society

Atomic Industrial Forum - Operations and Maintenance Committee

Electric Power Research Institute - Engineering and Operations Task Force (1979-1980)

Electric Power Research Institute - Nuclear Division Committee (1981-)

Licensed as an NRC Senior Reactor Operator on three different commercial nuclear power plants.

Chairman of the Susquehanna Review Committee (Off-site Nuclear Safety Committee)

EXHIBIT A

Federal Emergency Management Agency

Washington, D.C. 20472

AUG 21 1982

MEMORANDUM FOR: Walter P. Pierson
Chief
Natural and Technological Hazards Division
Region III (Philadelphia)

FROM: Richard W. Krimm
Assistant Associate Director
Office of Natural and Technological
Hazards

SUBJECT: Request by the Commonwealth of Pennsylvania for Radiological Emergency Preparedness (REP) Dosimetry Equipment Assistance and Guidance on FEMA-REP-2.

This is in reply to your memorandum, subject as above.

Federal Emergency Management Agency (FEMA) Headquarters recognizes the acute shortage of CDV-730 dosimeters in a number of the States for use in supporting the REP program. Based upon a recent survey of all States by the Emergency Management Programs Office, there are no known surplus CDV-730's in any State. Also, FEMA has no plans to procure additional quantities for either Civil Defense or REP.

It is important to note that the CDV-742 dosimeter is recommended for use in conjunction with the CDV-730 dosimeters in order to provide a redundant self-reading capability and an adequate read-out range extending above the emergency worker PAG's for whole body gamma radiation exposure. The CDV-742 dosimeter can be substituted for the CDV-730 dosimeter where there are shortages. The primary advantage of the CDV-730 dosimeter is that a more accurate reading can be made for low exposures. However, if the dosimeter is assigned to an individual and remains with him throughout the duration of the emergency, then the CDV-742 is adequate for a self-reading dosimetric device. We note that the State of Pennsylvania has an inventory of 112,872 CDV-742 dosimeters. The quantity in the State appears to be more than sufficient so that the number required to meet the REP requirements should be available within the State.

In developing radiation measurement and dosimetry systems, FEMA-REP-2 guidance encouraged States to use existing instrumentation and resources wherever possible. This document also indicated that the higher radiation levels are of more concern. Therefore, the use of two CDV-742's, if necessary, is a very logical choice to provide instrumentation for the potentially higher exposures that emergency workers could possible accrue. However, the CDV-742 can be accurately read in the dose range far below the maximum emergency worker PAG. FEMA Headquarters concurs with the Regional position that self reading dosimetry devices should be distributed, at least to county and or local levels. This is considered essential so that rapid final distribution to individual emergency workers can be made in a timely manner.

EXHIBIT B

Thermoluminescent dosimeters (TLD) have not and will not be made available by FEMA for State and local use. The Interagency Taskforce on Offsite Emergency Instrumentation for Nuclear Incidents, in examining the requirements for dosimetry, recommend a TLD system over other measurement systems such as film badges, for administrative documentation of each individuals exposure to radiation. Film badge dosimeters may serve as a substitute for thermoluminescent dosimeters, assuming film badge services including calibration and reading can be satisfactorily provided. The self-reading dosimeters were recommended so that individuals could keep track, on a current basis, as their radiation exposure was being received. The discussion regarding the need for non-self-reading devices for documentation is found on pages 5-8 and 5-9 of FEMA-REP-2. The TLD permanent record devices were recommended on page 7-5 as the preferable means for exposure record documentation for all emergency workers. FEMA still considers this a highly desirable procedure and will continue to recommend it.

Although the FEMA-REP-2 document dated September 1980 entitled, "Guidance on offsite Emergency Radiation Measurement Systems, Phase I, Airborne Release" is being considered for revision, primarily in terms of updating available information regarding plume airborne radioiodine monitoring methods, this document is considered to be FEMA guidance in the area of personnel dosimetry.

In summary we wish to emphasize that it is not FEMA policy to procure and grant emergency instrumentation to the States for use in REP. However, where instrumentation exists for civil defense purposes, it may be used also for REP providing its availability for Civil Defense is not adversely affected.