AIR and WATER
Pollution Patrol

BROAD AXE, PA. June 21, 1983

U.S. Nuclear Regulatory Commission
Atomic Safety and Licensing Board
Washington, D.C.20555

Judge Lawrence Brenner, Chairman; Judge Richard F. Cole; Judge Peter A. Morris

In The Matter Of
PHILADELPHIA ELECTRIC COMPANY
(Limerick Generating Stations, Unit 1 and 2)
Docket Nos. 50-352 and 50-353

Intervenor Air and Water Pollution Patrol (Romano) response to Applicant's interrogatories received June 6, 1983.

Applicant Interrogatory (AI)-1 I have not, as yet, settled on need for an expert. I will so notify you if I so decide.

AI-2 "Carburetor Ice... Still A Threat" AOPA Pilot, Tom Horn (April 1980). "Those Icy Fingers In Your Carburetor" January 1980 Aviation Consumer. AOPA Pilot, April 1978, "An Old Enemy That Still Claims Victims". Aviation Safety Digest, "Carburetor Ice Probability Chart". Article #48,49 Avemco "Flying Safety Update on Carburetor Ice". "Ice Formation on Aircraft" Aerology Series Number One, Bureau of Aeronautics, U.S. Navy.

AI-3 See AI-2; Environmental Statement LGS 1 & 2, Nov. 1973 P3-13 to P3-19, including Figure 3.11 and 3.12. Also LGS EROL 5.1.4.1; 5.1.22.

AI-4(a) AI-2; AI-3; LGS-EROL 5.1.4.1.3.1 and 2 and Johns Hopkins University, Applied Physics Laboratory (JHU/APL) Chapter V (Summary). Calculations and observations by me at the North West Incinerator releasing 100 times less water per hour than Limerick, nevertheless, as I observed, created carburetor icing conditions. Limerick will be 100 times more conducive to icing.

AI-5 Will not apply at present.

AI-6 Federal Aviation Administration requirement that a facility must pose "no hazard to aircraft', example, such as affecting meteorological conditions which might produce hazardous conditions for aircraft in that vicinity. Also "Ice Formation On Aircraft" (see reference in AI-4). Also Federal Aviation Administration, Part 91.

AI-7 Intervenor asserts that the operation of the plant with 35 million gallons of water, as vapor, released per day from Limerick towers relates, by increasing the potential for carburetor icing.

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AI-8 (a) Non-fuel ~~injected~~ fuel injected reciprocating engine aircraft.
(b) Does not apply.
(c) Saturated to non-saturated; temperature at or near dew point.
(d) Plume size at least as per LGS-1 & 2 November 1973, figure 3.10.
(e) As per AOPA (See AI-4 icing could take place in one minute under proper conditions. (e) (sic) perhaps F? as per LGS 1 &2 November 1973. Figure 3.10 at least.
(f) (sic) Applicant means G? Most aircraft have carburetor heaters but such heaters do not warn of sudden, invisible / or broken plume cloud, or localized saturated air at dew point.

AI-9 Meteorological and climatological data for hazardous conditions caused by increased moisture content by Limerick reactors increasing potential for carburetor ice deal totally with moisture-saturated air unable to hold more moisture, and at dew point, moisture condenses. And at temperatures below freezing ice can and will form including inside the carburetor. Also see AI-4.

AI-10 Visible and invisible Limerick plume could "trap" the many pilots using the Pottstown guidance 116.50 VOR from all directions only 1 mile from the Limerick facility. And not knowing of the towers and the isolated moisture condition, nor the need to take the precaution to apply carburetor heat, engine failure as a result of carburetor ice could result in dire consequences. The visible plume could be marginally transparent or broken, thus also permitting visual flight to intersect the Pottstown guidance VOR. Again the onslaught of saturated air encountered all at once at Limerick could create carburetor ice before the pilot, in particular new and inexperienced pilots, become aware of the need to consider it.

Also during an upwind approach to intersect the flight pattern, or a missed approach at Pottstown Municipal or Perkiomenville airport (with temperatures below 50° and humidity at 95%) up to six or seven minutes could be involved (more with other planes in the pattern) necessitating a possible go around, involving the up-wind leg, the cross-wind leg, and the down-wind leg during which time there generally is reduced throttle (perhaps 2000 RPM and without carburetor heat. In naturally high humidity together with isolated area tower-contributed moisture near dew point, dangerous carbureter ice could form and cause engine failure before the pilot could prevent it.

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At the three very close airports of Pottstown Municipal, Pottstown-Limerick, and Perkiomenville, there are new solo student pilots and many new inexperenced pilots flying. The potential for carburetor ice in these cases could result in fatalities.

AI-11 Generally the great majority type aircraft that the Limerick atmosphere modification will affect have no temperature indicators to warn of onset of carburetor ice.

AI-12 See AI-2 for conditions conducive to carburetor ice irrespective of whether the conditions originate at power stations or otherwise. See JHU/APL, Chapter V (Summary). Also LGS-EROL references in interrogatories.

As it relates to existence or non-existence of carburetor icing, question is premature in that the release of 35 million gallons of moisture and other peculiarities of Limerick require testing at Limerick with flight patterns of three different adjacent airports. The existence of these airport traffic patterns nullifies comparison with Chalk Point and Douglas Point (see JHL/APL chapter V-Summary).

AI-13 Response for AI-13 could fit AI-4 as well. On April 9, 1982 at 12:45 pm I was driving west on the Schuylkill Expressway and noticed a low cloud condition and restricted visibility. On checking I noticed the condition was caused by water vapor emitting from the Philadelphia incinerator at Roxboro.

I checked and found that the Federal Flight Service for that day and time was scattered to 1200 feet cloud ceiling, and 2.5 miles visibility for the general Philadelphia area, winds calm, with temperature about 50°F. However, at the Roxborough incinerator area including the nearby Ivy-Ridge railroad station (probably 400 feet lower (MSL)than the incinerator) the ceiling along the Schuylkill river and expressway was between surface and 100 feet, and the visibility in the direction of the river was roughly 100 feet.

Figures from the Philadelphia Sanitation Department given me indicate the incinerator, at most,discharges 375,000 gallons of water as vapor in one day, versus 35,000,000 gallons of water as vapor per day for the Limerick reactor...or almost 100 times more water as vapor than the incinerator.

If the effect on ceiling and visibility and moisture content is multiplied 100 times, it is evident that marginal VFR conditions in the Limerick area will restrict or endanger pilots,

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with risk of carburetor icing, reduced visibility, and icing of cold aircraft surfaces when entering the Limerick area. We should also include icing of runways due to condensation of moisture falling to form slick ice on runway surfaces whose temperature is below freezing...further increasing potential for fatalities.

AI-14 As it relates to Limerick, facts upon which I rely re high increase in hazards due to carburetor ice in aircraft flying in the tower moisture atmosphere contributing to the many days of quasi-high and naturally saturated atmosphere (with resultant potential for crashes and fatalities) are as described in previous answers. Further, reliance is placed on questions raised in JHU/APL, Chapter V, "Cooling Tower Plume-induced Flight Safety Hazards"; "Basically, while it is generally possible to characterize the conditions that will occur in the plant vicinity, it may be harder to translate that characterization into an assessment of impact on aircraft safety. Major complications in general, include the presence of traffic patterns over or near the site, and the presence of nearby airports. No such conditions exist at Chalk Point." Continuing in same report "Anyone penetrating a cooling tower plume in an aircraft should anticipate encountering severe turbulence of a few seconds duration. The interior of a plume appears to be an ever-changing pattern of eddies, and it is unlikely that any two penetrations will be exactly the same. This fact in itself could be a significant hazard. A pilot who has made one or two, or several passes, through a plume with no more than light-to moderate trubulence should not forget that the potential for very severe turbulence is always there. Becuase the duration of the turbulence is so short, and the most turbulent portions of the plume are usually visible, turbulence is not likely to be a serious hazard. However, it is possible that an unattentive pilot violating visual flying rules could temporarily lose control of his aircraft." * -- but not always visible.

Studies by Policastro et al (Ref. 5.1-38) see LGS EROL indicate predictions from models, theory, and calculations, at best only approximate plume behavior of single towers...and that "none of the currently available models (and studies) are adequate to predict plume geometry from multiple tower installations such as Limerick."

Further is the fact that the plume is erroneously represented as moving upward and outward as if in a constant direction and wind effect...and in ideal conditions as to ambient temperature and humidity. Near worse and worse conditions must be used, namely, stagnant, saturated, cold, "socked in" conditions

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for four or five days as occurs in that river area where Pottstown lies.

In spite of knowing the flying rules as the average pilot knows them, and being aware of the crucial and constant need to be attentive and to constantly monitor for evidence of carburetor ice, engine failure, as I once experienced, can come as quickly as turning off a light switch.

The documentary material responsive to your request in AWPP (Romano) possession will be made available for your inspection and copying at 11 S. Ridge Ave., Ambler, Pa.-24 hr notice is to be given to Frank R. Romano by telephoning (215) 646-1057 . Applicant can copy at 10¢/page, after July 4, 1983.

Very truly yours,

Air & Water Pollution Patrol
Frank R. Romano, Chairman

I hereby certify that copies of the foregoing have been served by First Class Main upon the latest Service list: Lawrence Brenner, Administrative Judge; Dr. Richard F. Cole; Dr. Peter A. Morris; Docketing and Service Section; Atomic Sagety and Licensing Appeal Panel; AnnP Hodgdon Esq & Elaine I Chan Esq.; Atomic Safety and Licensing Board Panel; Edw. G. Bauer, Jr. for Philadelphia Electric Co.; Troy B. Conner, Jr, Esq and Mark J. Wetterhahn; Director, PEMA*; James M. Neill, Esq.*; Robert J. Sugarman, Esq.*; Joseph White III*; Dr. Judith H Johnsrud*; Donald S. Bronstein, Esq.*; Steven P. Hersher, Esq.*; Managing Director City of Phila.*; Walter W. Cohen, Esq.*; Thomas Gerusky*; Thomas Y. Au, Esq.*; Jackie Rutterburg*; Judith A. Dorsey, Esq.*; Marvin Lewis*; Robert L. Anthony*.

* Without enclosure