

October 25, 1973

UNITED STATES OF AMERICA  
ATOMIC ENERGY COMMISSION

Before the Atomic Safety and Licensing Board

|                            |   |                   |
|----------------------------|---|-------------------|
| In the Matter of           | ) |                   |
|                            | ) |                   |
| METROPOLITAN EDISON        | ) | Docket No. 50-289 |
| COMPANY, et al.            | ) |                   |
|                            | ) |                   |
| (Three Mile Island Nuclear | ) |                   |
| Station, Unit 1)           | ) |                   |

APPLICANTS' PREPARED TESTIMONY  
RELATED TO  
ICING AND FOGGING

My name is Charles L. Hosler. I reside at 1000 Plaza Drive, Apt. 601B, State College, Pa. 16801. I am a meteorologist and have worked for 25 years in the field of weather modification--natural, inadvertant and overt. I have over 60 scientific publications in this field and serve on many Federal, State and professional panels and boards concerned with these problems. I have, since 1968, applied my knowledge in this field to determining what, if any, effects the heat and water vapor originating from cooling towers will have on local weather or climate. I have published papers relating the results of these studies.

Since 1968, in order to determine what might be expected as a result of evaporating a total of between 12,000 and 20,000 gallons of water per minute from the Three

Mile Island cooling towers, a number of theoretical and observational studies have been underway. While large evaporative cooling towers had been used widely in Europe with no ill effects reported, no experience was available in the climate of the Eastern United States to gauge the local consequences. Fortunately, an installation of four hyperbolic towers not very different from those proposed at Three Mile Island were in operation at Keystone in Western Pennsylvania and soon after towers went into operation at Homer City, Conemaugh and Morgantown, West Virginia. Also fortunately, cloud dynamics studies had produced numerical models which were potentially capable of predicting the behavior of the water vapor plumes emanating from these towers. It remained to check observations of actual plume behavior at Keystone with the model predictions.

In addition to intermittent ground and aerial observations since 1968, a systematic program of daily cooling tower plume photography was conducted in 1969. Detailed studies of the influence of weather and climate on plume behavior were carried out using data from Harrisburg State Airport, Olmstead, Washington, D.C. and Pittsburgh to assess any differences or similarities between Keystone and Three Mile Island. Spread over one year, aircraft ascents were made over Three Mile Island to assess the character of the vertical distribution of temperature and humidity and this was related to routine soundings taken in Washington, D.C.

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and Pittsburgh. Special soundings taken in Philadelphia were also utilized in this study.

It very soon became apparent that early concerns over surface fog production were unwarranted. The plumes from the Three Mile Island plant will ascend to heights always exceeding 1,500 feet and usually much greater. No visible plume will reach the ground and no increase in humidity will occur at the ground in the vicinity. By the time any moisture from the plume reaches the ground several miles downwind, it will be so diluted it will not be measurable. These conclusions are based on both observations at Keystone, Homer City and Conemaugh and theory.

The only remaining concern was any affect the visible plume might have on aircraft operations. A flight program was carried out in which a specially instrumented aerocommander twin engine aircraft used at Penn State to study cloud characteristics was used. On these flights, turbulence, vertical motion, liquid water content and cloud drop sizes were measured. Penetrations were made as low as 50 meters above the tower mouth. A summary of the results of these measurements reveals that: In no case was anything but light turbulence experienced and in most cases only a barely discernable uplift was felt. It is difficult to stay in the plume for more than a few seconds due to its small dimensions. On most occasions no droplets were observed to strike the windshield. On a few occasions drops were

observed to strike the windshield but in very small numbers and they immediately evaporated upon departing from the plume. Measurements of drop size revealed that most are too small to strike the air foil or windshield and the liquid water content of the cloud is very low compared to natural cumulus clouds.

Thus, in addition to the small time spent in the plume which prohibits accumulation of ice, even if one could stay in the plume, accumulations would be insignificant. Deposition of vapor from clouds on aircraft surfaces is too slow to be important and could not occur on most surfaces due to dynamic heating of the air near the skin of the aircraft.

In general, the measurements show that the visible plume is indistinguishable from small natural cumulus clouds and the only significant effect of the plume on air navigation is to reduce visibility during those few occasions (about 2% of the time) when extended plumes occur. These occasions all correspond to periods when there are almost certain to be low clouds and precipitation naturally present. The plume from the cooling tower has no special properties that will distinguish it from the natural clouds except its location. On the few occasions a year when the plume levels off immediately below the natural cloud base, there will be the effect of lowering the cloud base by as much as a few hundred feet. Because of the penetration achieved by these plumes,

this phenomenon will always occur at an altitude above 1,500 feet and usually above 2,000 feet. Thus in no case would this tend to increase the number of hours when ceilings would be below minimum.

In summary, it is my conclusion after five years of study of the Three Mile Island plant as proposed and similar installations operating over that period in Western Pennsylvania, that there will be no fogging or icing at the surface as a result of operating the four towers at Three Mile Island. The nature of the visible plume will not permit it to reach the ground. Upon leaving the visible plume, the small droplets evaporate very quickly and cannot reach the ground.

About 2% of the time mostly on cold, humid mornings or when rain or snow is falling, the elevated plume will be seen to extend a mile or more from the tower. This visible cloud of water droplets has all of the properties of a natural cloud and presents no hazard to aircraft which might penetrate it. In most cases, at some distance the plume is indistinguishable from and blends with natural clouds.