

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Atomic Safety and Licensing Appeal Boards

In the Matters of

PHILADELPHIA ELECTRIC COMPANY, et al.
Peach Bottom Atomic Power Station,
Units 2 and 3

METROPOLITAN EDISON COMPANY, et al.
Three Mile Island Nuclear Station,
Unit 2

PUBLIC SERVICE ELECTRIC AND GAS COMPANY
Hope Creek Generating Station,
Units 1 and 2

Docket Nos. 50-277
50-278

50-320

50-354
50-355

SUPPLEMENTAL AFFIDAVIT OF DR. CHAUNCEY KEPFORD
SETTING FORTH THE INTERVENORS' STATEMENT OF THE
FACTS AS TO WHICH THERE IS A MATERIAL DISPUTE

Chauncey Kepford, being duly sworn, states the following:

1. Despite numerous studies undertaken in an effort to locate a threshold level below which exposures to ionizing radiation can be considered "safe," no such thresholds have been found. To the contrary, the study of occupational radiation exposure of workers at the Hanford atomic facility in the state of Washington ("Radiation Exposures of Hanford Workers Dying from Cancer and Other Causes," Mancuso, Stewart, and Kneale, Health Physics 33 p. 369-384, 1977; see also "The Question of Radiation Causation of Cancer in Hanford Workers," Gofman, Health Physics 37 p. 617-639, 1979), the Stewart evidence on in-utero irradiation, and other studies have demonstrated significant adverse health effects even at low levels of exposure. In fact, the most reasonable conclusion that can be drawn from the existing data is that low levels of radiation, including those which are sufficiently low that they cannot be detected against background levels of radiation, cause cancer and leukemia induction in a linear or even supralinear proportion to dose.

2. Members of the population located in the vicinity of uranium mill tailings piles and abandoned uranium mines bear an additional risk of premature death from radon emissions that the general population at large does not bear. At the surface of a tailings pile, for example, where there has been little opportunity for radon emissions to become diluted

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by mixture with surrounding air, the radon levels may be quite high indeed. Wind blows dust from tailings piles or from abandoned uranium mines into nearby communities. There is always an additional hazard, as past experience demonstrates, that the tailings piles themselves will be used as a construction material, markedly increasing exposure levels for the affected population. Persons living or working in the vicinity of mill tailings piles may encounter a noticeable increased risk of premature death from cancer. Likewise, persons who are employed in the mining or milling of uranium are also subject to an elevated risk of premature death from cancer.

3. Radon emissions attributable to the nuclear fuel cycle also represent a major potential health risk to persons residing far from any uranium ore mine or mill tailings piles. The total health risks posed by the permanent releases of radon attributable to the nuclear fuel cycle may be as high as one hundred million premature deaths from cancer per annual fuel requirement per reactor. See the June 26, 1979, affidavit of Dr. Chauncey Kepford in this proceeding. Those figures represent the number of additional avoidable premature deaths which may occur per AFR per year, above and beyond those premature deaths caused by naturally occurring radon emissions.

4. The magnitude of the radon emissions attributable to the operation of a 1,000 megawatt electric commercial nuclear reactor for one year is truly prodigious, and in any event is sufficiently large and of sufficient duration so as to endanger the public health and safety now and far beyond the foreseeable future.

5. The continuing legacy of death and disability from radon emissions from the nuclear fuel cycle is neither remote nor speculative. The process of mining and milling uranium ore, as presently constituted, creates a permanent potential source of genetic mutation and premature death to all future inhabitants of the United States and beyond, leaving an irreversible legacy of contaminants -- a legacy which will endure for as long as there are people remaining. Even in the unlikely event that the makeshift, unenforceable policies of the NRC Staff could, if properly implemented, reduce the levels of fuel cycle radon emissions and the resultant cases of premature deaths for "thousands" of years, this alone

would not sufficiently protect the public health and safety. The Staff's proposal would at most reduce only a minute fraction of the total radon releases (and hence the total number of avoidable radon-related premature deaths) which result from the mining and milling of uranium ore to fuel commercial nuclear reactors. See Table 1 of the June 3, 1970, prepared testimony of Dr. Chauncey Kepford submitted on behalf of the Intervenor in the Perkins 1, 2, and 3 proceeding.

6. Substantial public health risks from fuel cycle radon releases will inevitably result under the regulatory approach which the NRC Staff has adopted. Considering the long time periods during which the mill tailings piles will remain hazardous, the untested and unproven reclamation techniques which the NRC Staff witness Miller alleges will reduce emissions from the mill tailings for thousands of years are essentially the same as the techniques which Staff witness Gotchy said in Perkins would work for only 500 years. The significant public health risks associated with radon releases from the nuclear fuel cycle can never be entirely eliminated once the uranium ore has been mined and milled. The only available mechanism for eliminating further additional risks from this source would involve the permanent shutdown of all nuclear reactors, coupled with a permanent moratorium on the mining and milling of uranium ore. Short of this remedy, significant reductions in fuel cycle radon-related risks can only be accomplished if procedures ensuring the permanent disposal of mill tailings piles and the permanent sealing of abandoned uranium ore mines are adopted and enforced. The NRC Staff, however, has developed proposals which are entirely inadequate to achieve such a result.

7. The treatment of the effects of low level radiation in the Perkins transcript is inadequate, and therefore the record is incomplete, because that Licensing Board decided that substantial portions of the pertinent testimony on this issue submitted by the Intervenor should be stricken from the record.

8. Much of what the Perkins Licensing Board had to say about low level radiation does not apply to alpha particles, which are the source of concern when considering radon-222 and its daughter products. In its relentless efforts to fabricate reasons upon which to base the silly de minimus theory, the Perkins Board adopted patently misleading and

inapplicable quotations put forth by Applicant witness Lewis (Perkins Initial Decision, para. 35). In fact, the reports cited by Lewis refer specifically to low LET radiation. It is well known that considerations relevant to low LET radiation do not apply to the very damaging high LET radiation of radon and its daughters. See NCRP Report 43, pages 11-12.

9. Even if the radon emissions attributable to operation of a 1,000 megawatt reactor for one year were found to be small compared to background radon, one could not conclude that these emissions or their effects are insignificant in any absolute sense. Background radiation from all sources contributes throughout the lives of all living organisms to a death risk of some magnitude. Any man-induced additions to background levels, however small in comparison to background or to fluctuations or differences in background levels, increase the background-induced death risk. The effect of these man-induced radon emissions from the nuclear fuel cycle will be above and beyond those caused by unavoidable naturally occurring radon emissions.

10. The de minimus theory is notable primarily for its obvious lack of concern for human lives. The Perkins Licensing Board would have us believe that because a carcinogen cannot be detected against its background sources once dispersed, or because it has not been identified as the causal agent of a particular instance of cancer, any incremental additions of this carcinogen may be ignored by declaring them to be insignificant. Such a conclusion assumes that all the impacts of any carcinogenic agent are not only known but are also separately detectable and identifiable from the impacts of any other carcinogenic agent. This assumption is unsupported by modern research findings or technology. For example, on the order of 300,000 people in the United States reportedly died from cancer in its various forms during 1978. While deaths due to cancer are identifiable, in principle, knowledge of which particular carcinogen or which combination of carcinogens produced each of these deaths has eluded the best efforts of modern man. Our alleged inability to detect which radon releases result from operation of a particular nuclear plant, as compared with background releases of radon, will not protect those who will be exposed to this

reactor-related radon and its daughter products.

The de minimus theory seeks to link indistinguishable sources, which happen to cause death in humans, with the conclusion that the number of resulting deaths must somehow be justified due to the undetectability of the cause. Under comparable circumstances, one would hardly expect a person accused of murder to defend his or her alleged actions by stating that murder is justified because a few additional deaths among an annual national death toll of two million will scarcely be noticed and may therefore be viewed as de minimus, or acceptable to society.

11. There is considerable uncertainty over the precise quantity of background radon levels and fluctuations in these levels. The existing data on this subject are relatively narrow. The values for background radon which do exist do not fully account for the effects of parameters such as weather, soil humidity, or geographic location. Rather, values such as the ones assumed by the Perkins Licensing Board represent soft estimates, and are not based upon thorough, systematic measurements.

12. In response to footnote 10 of the dissenting opinion in ALAB-640, it should be pointed out that reductions in the level of naturally occurring radon over the period of evolution of human beings from monocellular life have no bearing upon the regulatory obligations of the Nuclear Regulatory Commission. The NRC is mandated by law to protect the public health and safety, not to engage in experimentation in genetic engineering or cancer induction by allowing a reversal of the declining long-term trend in the production of radon gas. Moreover, in the absence of data confirming the physical, chemical, or ecological conditions under which human beings evolved, the role of radon in that evolutionary process and the consequences of reversing the decline of its natural occurrence in the environment cannot be determined. It should also be noted that billions of years elapsed with a concomitant reduction of background radiation levels before mankind evolved.

Sworn to and subscribed
before me this 18th day
of December, 1981

Linda K. Miller

LINDA K. MILLER, NOTARY PUBLIC
STEWARTSTOWN BORO, BORN COUNTY
MY COMMISSION EXPIRES OCT. 17, 1985
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on expires Oct. 17, 1985