

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION**

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of) Docket Nos. 50-247-LR
) and
) 50-286-LR
ENTERGY NUCLEAR OPERATIONS, INC.)
)
(Indian Point Nuclear Generating Units 2 and 3))
_____) June 28, 2012

**REBUTTAL TESTIMONY OF DR ANDREW S. KANTER, M.D. M.P.H. IN
SUPPORT OF HUDSON RIVER SLOOP CLEARWATER, INC.'s CONTENTION
EC-3A REGARDING ENVIRONMENTAL JUSTICE**

Q1. What is your name and your employment?

A1. My name is Andrew Kanter and I am employed as an assistant professor of clinical Biomedical Informatics and Epidemiology at the Earth Institute, Columbia University.

Q2. In what capacity are you providing testimony today?

A2. I am providing testimony in my individual capacity as an expert in the use of numerical tools to plan and implement programs to achieve health goals, specifically the public health response to a nuclear accident. I am currently President of the Board of Directors of Physicians for Social Responsibility (PSR) and have been a Board Member

for 10 years. I have been involved with nuclear issues from my early days and have not only studied the effects of radiation and the nuclear fuel cycle, he has have run simulations of nuclear reactor accidents and presented these at the UN NPT Treaty Review Conference in 2005. I recently presented on the challenges of evacuating populations around nuclear power plants to the American Public Health Association at their 2011 national meeting. A resume showing my experience is attached to this testimony as Exhibit CLE000049.

Q3. Do you also have expertise in emergency planning issues?

A3. Yes. I began my medical training in emergency medicine and was an Assistant Administrator for Emergency Medical Services for the UCLA Department of Community Safety. Since receiving training and board certification in Internal Medicine, I have followed a career in public health and informatics. In my role as a physician advocate, I have researched and presented on the medical response to nuclear weapons and nuclear power plant accidents for several decades.

Q4. What is your response to the following phrase contained in Entergy A63: “Commission has found that the need for protective actions beyond a few miles from the plant is extremely unlikely” (MJS)

A.4. Sophisticated computer modeling of a significant Loss of Coolant accident at a nuclear reactor using the same software used by Federal Agencies including the Hazard Predication and Assessment Capability (HPAC) package from the Defense Threat Reduction Agency and the Consequences Assessment Tool Set (CATS) from the Federal Emergency Management Agency, and real-world experiences from accidents such as Chernobyl and Fukushima, shows that Entergy’s risk assessment is optimistic. Although a severe accident is unlikely, it is reasonably foreseeable. If a severe accident occurs,

large releases of radiation (and exposure to populations) would be expected to extend a significant distance from the plants, even beyond the 50 mile limit recommended by NRC Chairman Jaczko for the Fukushima accident. To claim that protective action will not be required beyond a few miles shows a complacency that could endanger public health if it is permitted to justify failing to plan for evacuation of vulnerable populations or not taking other measures to reduce the consequences of an accident. In an interview on May 10, 2012, Chairman Jaczko admitted that the 10 mile zone was merely a “planning standard”, and that larger areas may require additional recommended actions.¹

Q.5. What is your response to the following phrase contained in Entergy A63: “the most likely protective action beyond 10 miles would be sheltering” (MJS)

A.5. Exposure to radioactive contamination from nuclear reactor accidents results not only from exposure to airborne radionuclides such as I-131 in the plume, but also from groundshine from deposited gamma and beta radiation emitters, and from the ingestion and inhalation of alpha, beta and gamma-emitting radionuclides. These internal exposures and groundshine are possible long after the plume has passed. Sheltering does not protect the population from this longer-term exposure, nor does it actually remove the requirement for eventual evacuation.²

Evacuation plans must take into account the need to relocate all affected populations within a contaminated zone for the long term. People who are unable to be moved quickly away from a contaminated zone will receive unwarranted radiation

¹ The Daily Mail Online: An accident waiting to happen? Populations around U.S. nuclear plants have grown 450% since 1980. CLE000056.

² Sheltering in place does make sense in certain circumstances to prevent acute exposure to the radioactive plume compared to being outside during an evacuation. Knowing which populations should be temporarily sheltered, *and communicating this clearly to the population*, is complex and fraught with problems, particularly in the case of a nuclear reactor accident.

exposure. Those without cars, who are incarcerated, are ill or in care facilities will be put at higher risk of injury than those who have the ability to evacuate themselves. Minority populations and those who are economically-disadvantaged have a higher burden of illness and reliance on medical devices and care facilities. These populations would be disproportionately burdened by the evacuation requirement and would be much more likely to be harmed by either the forced move, or the need to be sheltered in place.

In an analysis done by PSR of a core meltdown at the Braidwood nuclear reactor outside of Chicago using the HPAC and CATS software, we identified 113 hospitals and 32,000 beds that fell within the occupational exposure limit of 5 REM/yr. Over 6.2M people fell into the zone requiring EPA PAGs. If, as found in Fukushima (and Chernobyl), the areas with long term contamination extend far beyond the 10 mile limit, then millions of people would need to be evacuated. The typical surge capacity of hospitals in the US is small with perhaps 4-6% of beds available at any time.³ If we assume that 90% of the 32,000 beds were occupied at the time of the accident (and that there are probably 3-4 times the number of people affected when you consider staff members, family members, etc.⁴), where would these ill patients and family members be taken? A study in 2003 by James Lee Witt associates⁵ demonstrated that host communities are unlikely to be prepared to absorb the influx of people from the urban evacuation areas, and if you assume even a 10% available surge capacity requirement, you would need a hospital bed capacity of 290,000 beds to absorb these patients. For

³ PSR: The US and Nuclear Terrorism Still Dangerously Unprepared (2006).

⁴ Meit M, Redlener I, Briggs TW, Kwanisai M, Culp D, Abramson DM. Rural and suburban population surge following detonation of an improvised nuclear device: a new model to estimate impact. *Disaster Med Public Health Prep.* 2011 Mar;5 Suppl 1:S143-50.

⁵ James Lee Witt Associates: Review of Emergency Preparedness of Areas Adjacent to Indian Point and Millstone. Prepared for the Power Authority of the State of New York. 2003

comparison, this is three times the number of all available hospital beds in the states of New York, New Jersey and Connecticut combined.⁶ This relocation not only would put patients at increased risk from the move, but would require a substantial amount of pre-planning. The notion that this planning could be left to communities after the accident has occurred and be accomplished quickly enough based on live data from the monitoring stations (presuming they are working) is extremely unlikely. Hospitals have trouble coordinating for even small multi-casualty incidents. Coordinating the relocation of tens of thousands of patients in a very short period of time, including the need for transportation, security, portable medical devices, etc., would be impossible. Our study of the Braidwood area also identified the large number of first responders (police, fire, ambulance) which would be impacted by direct exposure to the radioactive plume. This simulation produced higher than occupational exposure limits for tens of thousands for fire and police and 20,000 physicians would also receive higher than occupational limits. Although it is possible that first responders will be altruistic and be willing to put themselves at greater risk to continue to respond within the contaminated area, it is also likely that many will choose instead to return home and protect family members and loved-ones. Regardless, the number of human (and other) resources available to respond in the case of an accident are likely to be considerably less than expected. Procedures for allocating scarce resources in the case of an incident such as an accident at Indian Point are not only unproven, but are unlikely to perform as expected during an actual accident.⁷

⁶ Numbers of hospital beds taken from: http://www.ahd.com/state_statistics.html

⁷ Timbie JW, Ringel JS, Fox DS, Waxman DA, Pillemer F, Carey C, Moore M, Karir V, Johnson TJ, Iyer N, Hu J, Shanman R, Larkin JW, Timmer M, Motala A, Perry TR, Newberry S, Kellermann AL. Allocation of Scarce Resources During Mass Casualty Events. Evidence Report No. 207. (Prepared by the Southern California Evidence-based Practice Center under Contract

Q.6. What is your response to the following phrase contained in Entergy A64:

“EPA guidance notes that implementation of protective actions should consider the risks of the radiation exposure versus other risks inherent in the evacuation process itself.” (MJS)

A.6. As described above in A.5., the risks of acute radiation exposure from the plume is only a portion of the long term risk to populations who are at risk of forced relocation. What is not considered is the longer-term risk to those populations from remaining in the contaminated zones. Even during the initial plume exposure, it is not clear that adequate protective measures can be put in place to prevent contamination of institutions and facilities where people do not have personal control over their environment. Following the initial exposure, deposition of radionuclides and contamination of food, water and air through re-aerosolizing of fallout makes residing in the contaminated areas unacceptable. Experiences from Chernobyl, and now Fukushima, is that large areas of territory require permanent evacuation. Both of those accidents affected relatively unpopulated areas (the vast majority of Fukushima fallout passing out to sea). Having a similar accident affecting an urban area such as the New York or Chicago metropolitan areas would necessitate the long-term relocation of tens of millions of people. Therefore, the ability to modify protective actions based on radiation risk and other risks does not dramatically alter the radiation risk part of the calculation over the longer term.

Q.7. What is your response to the following phrase contained in Entergy A65: “Westchester and Rockland County plans each address evacuation of transport-dependent individuals. See Westchester REPP, Implementation Procedure 5.0, Attach. 2 (ENT00285C); Rockland REPP at Procedures DPT-1, DPT-2, § 5.4, Attach. 3 (ENT00286B). Bus routes and stops are predetermined and publicized in emergency planning booklets and on county websites.” (MJS)

A.7. This response is inadequate on several levels. The first is that the area required for evacuation could be larger than anticipated. The number of people requiring evacuation will also be larger than anticipated as many people who fall outside the “official” evacuation zone will also demand evacuation. This applies both to the ability of the evacuation routes to absorb the evacuees, as well as the need for actual transportation. Moreover, bus-stops located outside are totally inappropriate for people waiting to be evacuated when acute radiation exposure from the radioactive plume is still possible. Given the likely difficulty in maintaining adequate movement during the evacuation due to the overburdened road system, the potential for people to be waiting a long time for evacuation, and hence increased opportunity for exposure, is high.

Q.8. What is your response to the following phrase contained in Entergy A65: “The routes end at pre-designated general population reception centers located well outside of the emergency planning zone.” (MJS)

A.8. As mentioned in A.4., the area affected by the accident is likely to be far outside the EPZ and these reception centers would need to be much farther away which increases the transport time, resource requirement, etc. for moving the evacuees. Lessons from Fukushima have shown that evacuation centers can be unwittingly located in contaminated areas. This raises the issue of proper notification and communication of real-time contamination information to all the necessary responders (on which most disadvantaged populations will rely upon). Even in highly organized and preparation-

heavy Japan, the access to and transmission of this critical information was unavailable. Ensuring that monitoring equipment, computer simulations, and exposure calculations are in good working order, operating appropriately and can be communicated to the necessary authorities in time to protect the evacuees is essential.

Q.9. What is your response to the following phrase contained in Entergy A70:

“FEMA conducts a comprehensive review of county plans biennially in preparation for an evaluated exercise at the Indian Point site.” (MJS)

A.9. As outlined in the previously cited Witt report, the review of the evacuation plans and the associated drills are insufficient to ensure that the protection of the public’s health. In addition, not only have the special needs of disadvantaged populations not been adequately addressed, but the scale of the accident and the circumstances under which the accident occurs have been underestimated.

Not only is it possible that the nuclear reactor accident occurred in the context of a willful attack, but that the same attackers, hoping to magnify the impact of their attack, might also target evacuation routes, first responders and other visible resources required for the State’s response to the disaster. The National Center for Disaster Preparedness⁸ also has shown the probability of a nuclear reactor accident in the context of a significant natural disaster (such as the earthquake/tsunami in Japan), a massive storm or flooding, means that resources available to assist with evacuation will likely be impacted and the methods and routes would likely also be disrupted.

⁸ ncdp.mailman.columbia.edu/

Q.10. What is your response to the following phrase contained in Entergy A73:“sheltering-in-place is likely to be the appropriate protective action for such facilities in the unlikely event of a severe accident. Further, nothing in the state or county plans preclude evacuation, if appropriate under the circumstances.” (MJS)

A.10. As described above in A.5. and A.6., the very nature of the accident will likely preclude evacuation of these facilities from being an option under the current evacuation plan.

Q.11. What is your response to the following phrase contained in Entergy A74:“(The Department of Health is to “determine protective actions for special facilities (e.g. nursing homes, hospitals, etc.).”); Westchester REPP at I-8 to -9 (ENT00285A) (“If protective actions are required, the county will . . . notify hospitals, nursing homes and other special facilities.”). These plans also provide for transportation assistance to and/or planning with these facilities.” (MJS)

A.11. As A.5. makes clear, the scale of the required evacuation of these health care facilities is unprecedented and cannot be addressed in an *ad hoc* manner. Current plans for triaging resources in the case of emergency are unlikely to be effective. The industry and NRC cannot have it both ways. Stating that the evacuation plan is sufficient, as most people will simply shelter in place, but then saying that these people will be evacuated if necessary are incompatible. As we have seen from both simulations and real-world evidence, the extent to which evacuation will be necessary far exceeds the narrow parameters included in current Indian Point plans, and that the populations likely to be disproportionately adversely affected by this poor planning are those who are institutionalized, elderly or infirm, or economically disadvantaged.

Q12. In accordance with 28 U.S.C. § 1746, do you state under penalty of perjury that the foregoing testimony is true and correct?

A12. Yes.

Executed in accord with 10 C.F.R. § 2.304(d)

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June 28, 2012