**THE NEED FOR REALISM**
**IN EVALUATING RADIOLOGICAL CASUALTIES**

The "Alvarez Report" claims that thousands of deaths could result from a fuel pool casualty.

The NucRegComm challenges the Alvarez et al. conclusions because they derive from "unrealistic" and unduly "conservative" premises. Correcting these premises leads to conclusion that no such hazard exists.

But those premises come from NucRegComm reports that also claim kilodeaths.

This is inconsistent. We must resolve the fact that nuclear plants and their fuel are safe while these "official" reports claim kilodeaths.

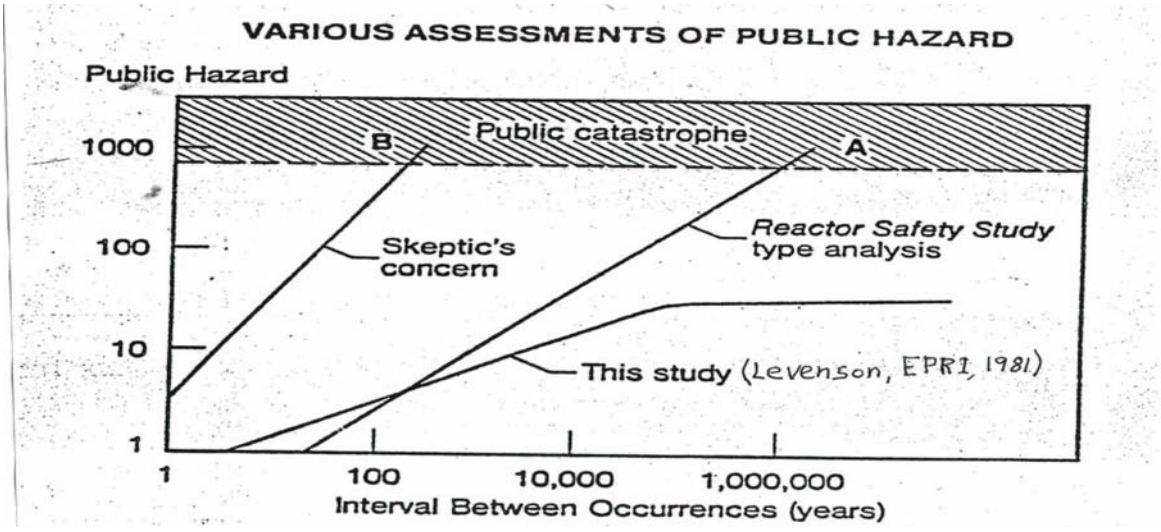
The NucRegComm knows of this discrepancy and is addressing it. I have been asked by President of AmerNucSoc to develop a program for ANS to work to that end also. Our views of the issue and how to resolve it seem now to be generally consistent.

We don't have to justify at this late date, why the old reports were so written. Using unrealistic premises to scope the boundaries of new problems for comparative purposes is fairly common. But reporting such calculations of deaths and other real-world consequences as though they were real is seriously misleading. Where that has been done, such "predictions" of deaths should be stated to be unrealistic—i.e. not relevant to the real world.

Starting shortly after 9/11, a group of 19 senior nuclear statesmen spent nearly a year preparing a **Policy Forum for *Science.*** It was our intent to document the conditions and limits that Nature, especially the physics and chemistry properties of materials and the actual consequences of real radiation exposures, impose on the worst realistic casualty. We found plenty of applicable information and data.

Starting ~30 years ago, **extensive research** by industry, academia and government, including theory, experiment, large-scale tests and epidemiological studies provided much of the documentation for **establishing realistic inputs** to our *Science* paper. These are supported by effects of several real casualties.

That work showed that physical properties of materials severely limit the release of radioactivity, even from molten fuel ,and dispersion from such fuel, especially in a water environment, and transport of radioactivity even with compromised containment. The **basic nature of the risk is different** than previously pictured.



Instead of arguing that the ultimate casualty is highly improbable, we can now show that **there is a nature-imposed limit to the consequences of even the worst realistic casualty**.

We started on the *Science* paper with these ground-rules:

We define ***unrealistic*** by its literal meaning: **not relevant to the real, physical world**

We therefore **exclude events that are precluded by the laws of nature and the properties of materials** involved.

We **don't consider it *conservative* to define the real world unrealistically**. [On this, more later.]

**We examine directly the worst realistic situation**, thereby transcending the need to foresee all relevant scenarios that might lead to a nuclear casualty. Analysis of many possible scenarios becomes irrelevant.

**We exclude unreasonable requirements** (e.g. that no one can move from a danger spot *for one year*).

**We *do* presume that all safety, protection and security provisions fail** (highly improbable). We presume core meltdown and unfiltered, ground-level reactor coolant release within an hour to a fully compromised containment structure.

**We use real test data** on fission-product release and dispersion, including condensation and plate-out on structures.

We concluded that the **worst realistic casualty to a modern nuclear power plant or its spent fuel could not cause more than a few, if any, deaths.**

From our examination, as with any dispersion of hazardous materials, the risk to the public is in the vicinity of the release where there are high material concentrations. For a ground-level release, this would be downwind to less than a mile. It appears that **mass evacuation** (e.g. everyone within 5 or 10 mile circle) is **probably counterproductive** in most circumstances.

*Science* published only 3 letters commenting on the paper:

Some comments **questioned** the airplane, the guards, and other **potential failure modes**. These **do not affect our conclusion**.

Some **questioned our statement that few, if any, members of the public died** at Chernobyl. But that statement was made authoritatively by UNSCEAR which received substantial review by the affected countries and other UN agencies. It has **not been substantively questioned.**

The objectors agreed that the **individual radiation doses would be small**, but argued that these risks **must be multiplied by the large exposed population** to get a death total. But ***populations* don't get cancers;** only *individuals* do. If no individual is harmed, then the population is not harmed.

This last point is crucial. There would be no megadeath predictions without this premise. It is invalid for two reasons:

**Low-dose radiation is not at all harmful; in most cases it is beneficial. The relevant doses are far below the range of natural background radiation and the safe doses of medical diagnostic procedures.** The only studies of medical exposures that claim adverse effects at low doses are those that arbitrarily draw a

straight line through zero from adverse effects found at high doses. In addition, studies that have "protected" organisms and cells from natural background radiation to below the lowest natural levels causes adverse health effects, consistent with indicating that radiation is essential to biological functions. In addition, thousands of experiments and many decades of human medical treatments before being displaced by antibiotics and other chemotherapies show that small radiation doses stimulate immunological and other functions that prevent and cure cancers and other diseases**.**

**Predicting deaths by adding up trivial doses** over large populations or over large periods of time is **scientifically indefensible.**

**Both of these points have been conceded**, even in the reports by regulatory and advisory bodies that nevertheless recommend using the premise that radiation is harmful down to zero radiation. (See Annexes 2 & 3 of the draft paper submitted separately .) They justify this recommendation as being "conservative" even if not justified scientifically. This concession has two important implications; It means that

questioning this invalid premise is **not attacking an established scientific theory**; it is merely challenging an administrative judgment.

if the **risks and costs** of this administrative judgment **exceed the benefits** provided, it should be revoked.

For example, this administrative judgment provides the basis for the EPA, DOE and NRC to set a limit of 4 millirem per year from the releases from Yucca Mt. even though natural background radiation varies from about 80 to 800 millirem per year, with areas in which millions of people are exposed up to 8,000 millirem per year, with local doses to more than 20,000 millirem per year to people in the high dose areas of Ramsar Iran.

It is reasonable for this review committee to make a more balanced judgment that reflects the more realistic assessment of the nature and magnitude of the actual risks of small radiation exposures.

I'm not asking the Council to repudiate the scientific findings of the advisory bodies. I am asking that you take them at their word when they say, based on their extensive reviews, that there is no scientific basis for finding that low-dose radiation is harmful and that the evidence indicates otherwise. On those grounds alone, (even without considering the extensive research data that directly refutes the LNT that the advisory bodies do not consider), it is clear that **the fear of radiation** built up by presuming harm where none has been shown to exist has been **detrimental to the health and safety of the public** and **creates a dangerously fearful public attitude** toward the possibility of radiological terrorism. We do not become safer by portraying the world unrealistically.

So **why is radiation policy based on something admittedly wrong? We're told it's "conservative!" But this policy is killing people.**

100,000 additional "voluntary" abortions after Chernobyl
Thousands scared off life-saving nuclear medicine tests
Thousands killed by food pathogens killable by irradiation
Thousands killed by air pollution from fossil-fired plants
Thousands killed by infections that cannot be adequately treated by antibiotics and surgery

In addition, fear constrains other technologies using radiation, and has wide-spread impact on emergency planning, energy policy, etc. This is not conservatism, it is fear-mongering. An example of how this effect actually manifests in the real world is given in the *WashPost* OpEd following.

*Theodore Rockwell*

WASHINGTON POST OP ED
SEPT. 16, 2003

# Radiation Chicken Little

I was recently invited to observe and offer advice during a revealing drill, spearheaded by the National Academy of Engineering, that tested how well information might be communicated to the public if a "dirty bomb" exploded in Washington. As I watched the interaction of real-life government officials and media decision-makers, I was struck by a glaring discrepancy: The rules for radiological emergencies are wholly inappropriate for such an event. They can change a relatively harmless incident into a life-threatening emergency. These rules apply not only to dirty bombs but also to any casualties involving nuclear power plants or their fuel.

A few minutes into the simulated exercise, a leader of the drill pleaded for some action, warning that radiation was killing people and hospitals were being overwhelmed. This bothered me, because it is well documented by all our official agencies that the radioactivity in dirty bombs is unlikely to seriously hurt anyone. People not injured by the conventional explosion itself could walk away and be out of danger. If concerned about possible contamination, they could remove their clothes and take a shower.

I made this point publicly to the participants, but they said they're getting a different story from the regulators and their scientists. The rules require a hypothetical, squeaky-clean condition, scrubbing the ground and sidewalks down to far less than the natural radiation background of God's good green Earth—less radiation than millions of people get each year from routine medical procedures. That's the kind of thinking behind statements that the city would have to be evacuated for years after such an attack and that cleanup would cost billions. But these requirements are inappropriate. We don't treat other spills and leaks so fearfully.

If your aim were to remove a public health hazard, you would flush any residual radioactivity down the drain with hoses and be done with it. Would that contaminate the Chesapeake Bay? Not in any practical sense. It would add insignificantly to the bay's overall natural radioactivity. Expensive instrumentation might detect it for a while, but it would not create a public health hazard.

Several participants objected that experts might agree on that, but that the public would panic nonetheless, and that's what we should plan for. At this point, an expert on human behavior got up and said flatly that if you tell people there is no danger, and they have no reason to disbelieve you, they will remain calm. (They did so during the recent blackout.) But if you keep telling them you expect them to panic, they will oblige you. And that's what we're doing.

When I raised this issue with a Nuclear Regulatory Commission official years ago, he replied in horror that if he bought my reasoning, he'd have to ask what he was there for. He should, and so should the contractors and scientists devoting their careers to detailing thousands of unrealistic "what-if" scenarios. When pressed, they justify their actions by saying, "We're just trying to ensure safety." But pushed to such extremes, we're not safer; we're just wrong. The Nuclear Regulatory Commission chairman, Nils Diaz, has asked that more realistic premises be used to evaluate safety—not looser, not lower, just more realistic. That's a good start. Real safety is based on realistic premises.

On that basis, we should ask why our emergency planning calls for evacuating millions of people around nuclear power plants. Certainly such a mass evacuation would be a mess. (If you really thought the air was full of fission products, would you want to order people to go mill around in it?) The question is, could any realistic damage to the plant warrant such evacuation? The answer, as described in the Sept. 20, 2002, issue of Science, is that one can do nothing to an American-type nuclear power plant or its fuel that would create a serious public health hazard. You might produce a meltdown, as occurred at Three Mile Island, but that event caused no human or environmental injury. Even if the containment structure were also compromised, physical tests and analyses of spent fuel show there would be little dispersion, so there would be few if any radiation injuries. By assuming otherwise, we create unwarranted terror, and the terrorists win.

*The writer has many years' experience in nuclear engineering. He is a member of the National Academy of Engineering and a founding officer of the engineering firm MPR Associates.*

**Summary:**

Several old "official" reports have similar unrealistic premises to those in Alvarez. They also predict kilodeaths. Modifying fuel pool loading would not resolve this discrepancy with the science.

"Scoping studies" with unrealistic premises may have once served a purpose. It must now be made clear that their "predictions" of kilodeaths are not realistic-- ***not relevant to the real world.***

There is **no scientific evidence that low-dose radiation is harmful**. This has been conceded by relevant authorities. Regulators have presumed otherwise to be "conservative."

Presuming that low-dose radiation can cause cancer and death when the science does not support that conclusion is not conservative. It is simply wrong. **Policy based on wrong premises can be detrimental to the public health.**

Adding up trivial radiation levels to predict deaths in an irradiated crowd is scientifically indefensible. **If no person is injured, then there has been no injury.** Regulations and practices to the contrary should be changed.

I commend NucRegComm's program to resolve the contradiction of reports "predicting" massive death tolls unsupported by our current knowledge. I will work with the AmerNucSoc in this effort and **urge the NatResCouncil to add its considerable weight to this important task.**