

Reconsidering LNT: 3.0. The Autopsy

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We have government of the people, by the bureaucrats, for the bureaucrats.[Milton Friedman]

On July 1, the NRC released its proposed rule changes in response to Trump's May, 2025 EO requiring the NRC to "reconsider" LNT. A month ago I predicted what the document would say and would not say. Here's my score card. My prophesies are in italic.

The response will not say that LNT is biological nonsense. It will not acknowledge that LNT is the no DNA repair theory whose foundational premise is contradicted by well established, indisputable biology. It will not point out that the radium dial painters and the Taipei apartment dwellers clearly falsify LNT.

This was a lay up. Instead we are told

the NRC recognizes that there is insufficient evidence to refute the use of the LNT model [page 24];

and given this gibberish:

The NRC considers its current standards for protection against radiation to be science-based to the extent that adequate methods and analyses have been applied in the works that have been referenced in the development of the NRC's regulations and guidance. [p 21]

My second prediction was:

The response will embrace the Muller Trap and accept the false LNT or no threshold dichotomy.

Another layup. The NRC is quite explicit:

To date, no threshold has been established in this model, meaning that as the dose decreases to zero, the corresponding risk follows **proportionally** to zero. [p 24]

Emphasis mine. Proportionally is the key word in this non-sequitur.

It will offer the deeply flawed INWORKS study as support for LNT, and ignore Life Span Study (LSS) of the bomb survivors on which the Japanese and American taxpayers have spent nearly a billion dollars over 70 years, despite the fact that until recently the LSS study was the NRC's Goldstandard. What changed was the Radiation Effects Research Foundation admitted their LSS data is non-linear. It will

point out that the LSS exposures were acute dose rate profiles despite the fact that LNT claims there is no difference between acute and chronic profiles. It will also ignore the Nuclear Shipyard Workers Study by far the best controlled of the nuclear worker studies.

Only half-right on this one. The NRC does ignore the Life Span and Shipyard Studies; but it also makes no mention of INWORKS. In fact, no data at all is offered to support its claim that LNT is "science-based". The document carefully stays away from both DNA biology and radiation harm data. That's how weak the case for LNT is.

It will not say what counts is not the cumulative dose, not the average dose rate, but the entire dose rate profile. In fact, it will never use that term. Instead it will repeatedly talk about the "dose", implicitly accepting LNT. There will be no mention of the repair time. What recommendations it comes up with will be based on the biologically meaningless and medically dangerous period of a year.

Mostly right. "dose" as in total dose is used over and over again, which is an implicit acceptance of LNT. All the limits are based on a year. Repair time is never mentioned. The word "repair" shows up exactly twice in 180 pages, once only to make the point that DNA repair does not necessarily imply a threshold:

At present, there is no scientific consensus establishing a threshold below which stochastic health effects do not occur. As described in SECY-12-0064, as it relates to stochastic effects, 'It is unlikely there might be a threshold level of exposure below which biological response does not occur. Such a threshold could only occur if DNA repair processes were totally effective in that dose range or if a single radiation track were unable to produce an effect. The cellular processes such as apoptosis and cellular differentiation that can protect against later phases of tumorigenesis are judged to be efficient but can be bypassed; there is no reason to believe that those defenses act differently on spontaneous and radiation-induced tumors or have specific dose dependencies.'[p 31]

But the proposal does not just "implicitly accept" LNT. **The NRC reaffirms LNT.** Trump and the DOGERS be damned.

Stated another way, the NRC proposes to continue to use the linear dose response model, as it continues to be the most appropriate model upon which to base a radiation protection framework;[p 27]

Accordingly, the NRC reaffirms its position that the linear dose response model is the most appropriate available consensus model for formulating radiation protection standards and planning radiation protection programs.[p 32]

The document then repeatedly uses LNT to compute the cancer incidence associated with its proposed limits. It also uses LNT to defend dropping the current public dose rate limit outside the plant:

Second, the NRC is proposing to delete the short-term dose rate limit in the unrestricted area of 0.002 rem in any hour [0.02 mSv/h] in § 20.1301(b) because it serves no safety purpose that is not already achieved by the public dose limit of 100 mrem per year. This is because a member of the public could receive the full 100 mrem annual public dose instantaneously and this fact in and of itself would have minimal safety impact.[p 68]¹

Finally, the NRC uses LNT to allow *Planned Special Exposures*, in which a plant worker can "apply" his four previous years "under-exposures" (50 mSv - actual annual exposure) plus this year's 50 mSv to obtain the limit for a single exposure. This could result in an acute dose of 250 mSv. Page 61 cites LNT correctly pointing out that under LNT there is no difference between 250 mSv received all at once and 250 mSv spread evenly over five years. This change is a full throated endorsement of LNT; and a little too risky for my taste. The SNT cancer incidence for 250 mSv **acute** is nearly 4%.

It will not offer a well defined replacement for LNT. Therefore, the NRC has no way of converting an acceptable risk to dose rate limits. Despite this, it will call for some relaxation of the current limits, probably 50 mSv/y for nuclear workers and 5 mSv/y for the public, without offering a compelling argument for these numbers.

Wrong. The NRC's proposed replacement for LNT is LNT, a well defined model. The 50 mSv/y is slightly relaxed by the Planned Special Exposure rule. There are some changes to the radiotherapy caretaker limits, which I did not know existed. The public limit is 1 mSv/y (not 5). It is not changed, but the emissions limit is relaxed from 0.1 mSv/y to 0.25 mSv/y. LNT is used to defend this change.

It will make a few handwaving generalizations about not requiring ALARA. But since it offers no replacement for LNT, there will be no way to do the benefit-cost analysis needed to actually tell the regulator where to stop. Whether or not ALARA is dropped in name, regulator incentives will remain unchanged and so will the regulator's behavior.

Wrong, except for the last sentence. The term "ALARA" is banned from all NRC regulations. But then the NRC goes to great pains to explain that the regulatory philosophy hasn't changed. ALARA is partially replaced by a *graded approach* to exposures below the limits. The idea is

¹This last sentence is correct. 1 mSv acute would not be detectable. What they are saying is we have set the annual limit so low that it could be a reasonable daily limit.

we impose regulation below the limits to ensure that the limits are not breached. And just so everybody knows that nothing has really changed:

The graded approach to dose management would rely on a series of threshold doses below the regulatory dose limits and dose management actions to be taken at each threshold dose. These threshold doses and dose management actions would **generally correspond to existing requirements in 10 CFR part 20 or other regulations** and, therefore, should already be incorporated within the radiation protection programs of existing licensees to a degree 'commensurate with the scope and extent of licensed activities' as is currently required by § 20.110[p 48]

Again emphasis mine.

Cost-benefit analysis is now allowed as an argument against being forced to further reduce exposure; but the licensee has to show that it will cost more than \$5200 to reduce exposure by one person-rem (10 mSv). In other words, the regulator can impose any requirement that costs less than \$5200 per person-rem. Further the burden of proof is on the licensee to show that the cost is more than \$5200. Cost-benefit analyses like these require all sorts of assumptions. Who decides whether the licensee's assumption are reasonable? The regulator.

There will be no discussion of the deadly downside of LNT, the unnecessary evacuations and exiles, the millions of lives shortened by fossil pollution, and the failure to raise billions out of poverty.

Thus was a slam dunk. There was a grudging admission that in the past some of our implementation of ALARA might have been overly conservative. Here's as close as the NRC can come to an apology:

Regulatory experience, though, has demonstrated that the primary issue is not the standards themselves, but their implementation. For example, those standards that go beyond what is necessary for reasonable assurance of adequate protection and that can be interpreted as requiring continuous dose reductions even to very low doses of radiation have often been applied without a reasonable stopping point. In these instances, the radiation protection standards have led to outcomes that are overly conservative. As a practical matter, such over conservatism can significantly undervalue the benefits of activities when compared to their risks, sometimes at great economic costs or stifling of innovation.[p 23]

I guess you can call immediately killing 50 feeble old people, shortening millions of lives, and impoverishing billions economic costs.

The response will end up neither endorsing nor repudiating LNT, but call for more study, preserving the status quo.

Wrong. The NRC's replacement for LNT is LNT. The proposal is a strong endorsement of LNT as a basis of regulation. The NRC does make one valid point. The document doesn't really try to defend LNT on biological or empirical grounds. ***Their strongest argument for staying with LNT is there is no alternative.*** They make this point several times:

The NRC recognizes that there are limitations to the accuracy of the LNT model at very low doses, however, the NRC has also not identified a suitable alternative model.[p 32]

However, the NRC finds that no consensus-supported, regulation-ready alternative model to the LNT model exists at this time.[p 24]

At least some of the drafters/reviewers were aware of the Sigmoid No Threshold (SNT) model. I sent a copy of SNT: A Plug IN Replacement for LNT to Ms. Kenny who is the NRC lead for this document, and received a polite acknowledgement. SNT is "regulation-ready". But the NRC has the "no consensus-supported" part right.

The radiation protection profession is split into two groups: LNTers and thresholders. The entire profession accepts the false dichotomy that it's either LNT or a non-zero threshold. The LNTers reject SNT because it's not linear. Much worse SNT comes up with results that say that a big release is not a big deal radiation-wise. SNT would put most of the radiation protection people, including the NRC, out of business.

The thresholders reject SNT because it accepts the no threshold doctrine. But they don't offer a well-defined alternative, where well defined means a computer program for converting any dose rate profile into a prediction of cancer incidence. As a result there is no consensus-supported alternative. The NRC is quite content to use this fact to continue to base regulation on a model that is biological nonsense. LNT perpetuates the Intolerable Harm Lie, and that's what the bureaucrats need to continue to govern nuclear power and us.

Bottom line: LNT's auto-genocidal reign continues. A release will be just as deadly on paper if the proposed rules are imposed as if they are not. The regulators' incentives remain unchanged whether or not they are allowed to use an acronym. ALARA is a symptom not a cause. It was just a codification of what the AEC was already doing with its autocratic power. ALARA was not officially adopted until 1974. The most massive increase in US nuclear costs took place between 1967 and 1973.

To expect a regulator to change regulation in a way that puts him out of a job is imbecilic optimism. This document is a clever attempt to blame LNT's tragically wrong implications on ALARA; and thereby allow LNT to survive. LNT must be expunged from the outside. In this case, it is as simple as an Executive Order.