The Coalition to Stop Radioactive Pollution

Beyond Nuclear
Committee to Bridge the Gap
Ecological Options Network
Fukushima Fallout Awareness Network
Generational Radiation Impact Project
HEAL Utah
San Luis Obispo Mothers for Peace
Nuclear Energy Information Service
Nuclear Information Resource Service
Oregon Conservancy Foundation
Physicians for Social Responsibility
Rocky Mountain Peace and Justice
Samuel Lawrence Foundation
Texas Nuclear Watchdogs

30 August 2026

Attn: Nuclear Regulatory Commission
Washington, DC 20555-0001
Submitted electronically via regulations.gov

Re: Docket NRC-2025-1140 - Reforming and Modernizing the Radiation Protection Framework

On behalf of the Coalition to Stop Radioactive Pollution, we respectfully submit these comments regarding Docket NRC-2025-1140, *Reforming and Modernizing the Radiation Protection Framework*.

As a Coalition, and as individual organizations comprising the Coalition, we are compelled to place on the record our fundamental opposition to the Nuclear Regulatory Commission's (NRC) proposed rulemaking. If adopted, this rulemaking would constitute a monumental shift in the current radiation protection guidelines. The NRC's continued reliance on the assertion that the proposed revisions will "maintain reasonable assurance of adequate protection" constitutes an egregious mischaracterization of the scope and significance of the proposed rulemaking. This formulation minimizes the profound implications of the proposed changes by suggesting that the existing levels of protection will be preserved, while the rulemaking would in fact eliminate or substantially alter the fundamental principles and precautionary mechanisms that have

historically governed radiation protection standards in the United States. The proposed rule would dramatically increase the legal radiation exposures to workers and the public, as well as releases to air, water, and sewage, through surreptitious means.

This proposed rule change comes at a time when scientific knowledge has made clear that the health risks of ionizing radiation are more significant than previously understood. It also comes at a moment when the enduring health, economic, social, and environmental consequences of past radiation exposures are *still* being experienced by communities affected by the nuclear industry. These are not merely historical or individual harms: entire communities continue to bear the cumulative and intergenerational consequences of radiation exposure and contamination. With this knowledge, weakening the nation's radiation protection framework would move in precisely the wrong direction. What we need is a move toward stronger, science-based protections and toward greater awareness of the real risks and health consequences that will be borne by everyone living in the US. The risks should be clear to those who must bear them, and radiation regulations should be required to be consistent with the United Nations Declaration on the Rights of Indigenous Peoples, which requires consultation and freely given prior and informed consent. This proposed rulemaking is a shameful attempt by the NRC to legally, unjustifiably, and unnecessarily increase exposure rates to workers and the general public. The proposed rule aims to significantly weaken US radiation protection standards which are already insufficient.

Should this rulemaking move forward, we believe the outcomes will be catastrophic. We maintain that adoption of the proposed rule, whether in its entirety or through any of its individual provisions, would undermine essential protections for public health and for safety of atomic workers and the public from radiological risks in the United States. The NRC's proposed revisions are not supported by the most up-to-date, peer-reviewed scientific evidence, nor do they reflect the prevailing scientific understanding of the human health consequences of exposure to ionizing radiation.

The proposed rulemaking lacks an adequate evidentiary and scientific basis and represents a significant departure from the precautionary scientific evidence-based approach that should govern the regulation of radioactive environmental pollution. This deficiency is particularly evident in the NRC's assertion that implementation of its proposed rule will result in "increased public exposure to Ionizing Radiation…with potential stochastic health effects of *unknown magnitude*… expected to be minimal" [see US Nuclear Regulatory Commission 2026a, 27, Table 4, emphasis added]. Such a conclusion is deeply concerning because it fails to identify and appears to minimize the potential consequences of increased exposure while simultaneously failing to demonstrate an adequate scientific basis for determining that the associated risks are sufficiently small to warrant weakening existing protections. Dropping the regulation of stochastic impacts is further confirmation that the NRC is abdicating its authority, and therefore its *responsibility*, to protect all those living and working in the US from radiological harm. When stochastic health effects are "out of scope" of the regulations, the level of deregulation no longer demonstrates compliance with NRC's statutory obligations.

Furthermore, the full scale revision of one hundred percent of the NRC's Code of Federal Regulations in one 18-month period precludes meaningful public engagement. The affected public, individuals, organizations and state and local governments are flooded with enormously important revisions comprised of more content and background material than can be taken in,

analyzed, and commented on in this timeframe. Moreover, many of the provisions in the revised rule NRC 2025-1400 violate the APA, NEPA, the Atomic Energy Act, and the Nuclear Waste Policy Act and its amendments.

We strongly encourage the Commission to give careful and full consideration to the scientific evidence and analysis presented herein, which demonstrate the need for stronger, not weaker, protections from the risks of ionizing radiation. The evidence makes clear that this is not the time to diminish longstanding safeguards or relax the regulatory framework governing radiological exposures. Rather, the NRC should strengthen its commitment to robust, evidence-based protections for workers and the public.

We urge the NRC to abandon the proposed rulemaking in its entirety and work instead to preserve and strengthen the protections necessary to safeguard public health and safety in the United States. We recommend that the NRC bring civil nuclear regulations into line with the Environmental Protection Agency's (EPA) longstanding commitment to reducing exposures to workers and the public and to regulate down to very low risk levels. Current EPA protections provide seventy times more protection from radiation exposure to neighbors living next door to Super Fund sites than does NRC to any member of the general public. There is no justification for the NRC to allow additional harm.

PART I

THE COALITION TO STOP RADIOACTIVE POLLUTION'S RATIONALE FOR WHY THE NRC SHOULD ABANDON THE PROPOSED RULEMAKING

1. ENDORSEMENT OF EXPERT COMMENTS FROM DR. ARJUN MAKHIJANI

We endorse and support the conclusions drawn in the expert comments submitted by Dr. Arjun Makhijani on behalf of the Coalition to Stop Radioactive Pollution and the Safe Energy Rights Group. We ask that the NRC please review and duly consider the comments from Dr. Makhijani, an expert in radiation regulations.

2. THE CURRENT RADIATION PROTECTION STANDARDS ARE ALREADY INSUFFICIENT

The NRC's limits for annual radiation exposures are outdated and, given the current scientific understanding, are insufficient when it comes to offering adequate health protections. The NRC's public dose limit, 100 mrem per year, was set 35 years ago; the NRC's worker dose limit, 5 rem per year, is two-thirds of a century old. Over that time, the science of health impacts from low-dose radiation exposure has advanced considerably, demonstrating that we have continued to underestimate the risks from radiation, which is more harmful than was previously understood.

The NRC is supposed to base its radiation protection standards on the Biological Effects of Ionizing Radiation (BEIR) studies by the National Academies of Science, Engineering, and Medicine. BEIR VII's lifetime excess cancer risk estimates are 35% higher than BEIR V's, and BEIR V's are 3 to 18 times higher than BEIR III's [NAS-NRC 1990, 176, table 4-4; US EPA 2011, 3]. When the NRC last revised its radiation regulations in 1991, the agency acknowledged that BEIR V indicated higher risk of radiation harm but declined to tighten its limits accordingly [Peterson et al. n.d., 3].

More recent high-quality, peer-reviewed science (for instance, the INWORKS and EPI-CT studies) demonstrate even higher risks from low-dose radiation [Richardson et al. 2023].[1] BEIR VII risk coefficients (1.17×10^{-3} cancers per person-rem) indicate that NRC's public annual dose limit of 100 mrem would produce a cancer in one out of 100 people exposed at this level. This is an immense, unacceptable risk, and far higher than the 1-in-a-million cancer risk level that is standard in other federal statutes and regulations including, but not limited to, the Safe Drinking Water Act and the Comprehensive Environmental Response, Compensation, and Liability Act. As Ramona Trovato, then director of EPA's Office of Radiation and Indoor Air, put it:

[1] For more information, see the Internation Agency for Research on Cancer's information about the EPI-CT: International pediatric CT scan study: https://epi-ct.iarc.fr/.

> "Radiation should not be treated as a privileged pollutant. You and I should not be exposed to higher risks from radiation sites than we should be from sites which had contained any other environmental pollutant." [Trovato 1997]

The NRC's existing radiation protection standards were already too weak, treating radiation as a privileged pollutant at the expense of the health of Americans; NRC's proposed weakening of radiation standards makes the situation much worse.

Some of the key weakenings in the NRC's proposed rule that would allow higher radiation exposures include:

- Allowing workers to be exposed to 10 rem in a year – which is double the current yearly occupational limit – as long as the total exposure over 5 years remains below 25 rem [Nuclear Regulatory Commission 2026b, 43472]. If 100 workers worked for only 5 years under these conditions, 3 of them would get cancer just from those 5 years of exposure; over a 35-year career, radiation exposure at the limit would cause 1 in 20 workers to get cancer (see Hirsch 2025; Hirsch et al. 2025);
- Lifting the current 500 mrem cap on applications for "alternative" dose limits for the general public; letting industry apply for, and the NRC at its discretion grant, public dose limits of theoretically unlimited magnitude. The public dose limit is 100 mrem, and the NRC already lets licensees apply for alternative public dose limits; what the NRC is newly proposing is to remove the 500 mrem cap, potentially allowing alternative public dose limits with no upper bound [Nuclear Regulatory Commission 2026b, 43473];
- Greatly raising the limit on radioactivity in 20.1101(d) in facility effluent [routine releases of radiation in air and water from nuclear reactors and other facilities] from the ALARA current 10 mrem limit up to 25 mrem. Worse, the *de facto* standard that the NRC proposes is to allow effluent radioactivity up to the public limit, 100 mrem, a 10x increase, requiring only that licensees submit to the NRC paperwork considering (but not necessarily implementing) ways to reduce these effluent doses [Nuclear Regulatory Commission 2026b, 43471].

We hold that the NRC should abandon the current rulemaking on the grounds that the current radiological protection standards are outdated and do not rely on the most up to date, independent, quality, peer-reviewed science.

3. NRC REGULATES FATAL CANCER RISK AT LESS PROTECTIVE RATES OF HARM THAN DOES THE EPA

Existing radiation standards from the US Nuclear Regulatory Commission (NRC) are not protective. The Commission published a risk assessment of radiation at the level of its own limit for the public: 100 mr a year. In the Federal Register Notices, "US Nuclear Regulatory Commission, Below Regulatory Concern Policy Statement" (3 July 1990; Vol 55, No. 128, pp.

27522–27537) the NRC states in Table 1 that there are 3.5 fatal cancers in every 1000 people exposed to 100 millirems a year across a 70-year lifetime.

When 1000 is divided by 3.5 the simplified result is that **1 in every 286 people will die of cancer** attributable to radioactive pollution that NRC declares to be "legal." And this comes from each and every separate license for medical clinics, universities and other research sites, nuclear power reactors, uranium processing facilities, radioactive waste sites, and many almost invisible industry services (e.g., nuclear laundries, repair shops for contaminated components, etc.).

Moreover, the 1 in 286 fatal cancer is measured on the industry standard Reference Man [ICRP 1975]. Reference Man is the "apple to apple" part of the nuclear regulation world. He is the "radiation target" – but he cannot represent pregnancy, infants, children, elders, or females of any age [see Nichols and Olson 2024].

The thing they do not say in the Federal Register notice is that no US Federal agency has the authority to override our Human Rights to health, and to a healthy environment. Nuclear regulation cannot be reconciled with the need to protect the human—and all other species'—lifecycles from ionizing radiation. Even a single radioactive emission has the potential to destroy the integrity of DNA in a cell – the very stuff of life. Nonetheless, people who live next to a SuperFund site have 70 times more protection from radiation provided by the US Environmental Protection Agency, and the rule which states that protection of the public means only one cancer (fatal or not) incidence per every 10,000 people [see EPA 2001]. Other EPA standards are even more stringent. No one discloses this information to neighborhoods near nuclear licensed operations. We are simply treated as sacrifice zones.

4. THE DEMONSTRATED EFFECTS OF IONIZING RADIATION ON CHILDREN

The scientific evidence demonstrates an important fact: fetuses, newborns, infants, toddlers, children, and adolescents are not simply small adults. Their organs and tissues are developing rapidly, their cells are dividing more quickly, their metabolism differs from adults, and they have many more years in which radiation-induced cancer or other health effects may develop. Radiation protection standards based primarily on generalized adult population models therefore cannot automatically be assumed to adequately protect developing human beings. Peer-reviewed research reviewed in this document demonstrates why developmental stage matters.

The strongest human evidence concerns radioactive iodine and childhood thyroid cancer. Following the 1986 Chernobyl disaster, multiple long-term studies have found a strong association between childhood exposure to radioactive iodine and increased thyroid cancer risk [see, e.g., Brenner et al. 2011; Cardis et al. 2005; Tronko et al. 2006; Zabltska et al. 2011].

Other research has associated internal cesium-137 exposure with impaired lung function and other biological effects in children [Svendsen et al. 2010; Svendsen et al. 2015; Vykhovanets et al. 2000]. Studies of prenatal exposure have reported developmental and cognitive effects and increased chromosomal damage [see, e.g., Grollino et al. 1998; Mikhalevich et al. 2000; Stepanova et al. 2002; Stepanova et al. 2016], with some abnormalities remaining detectable years later [Heiervang et al. 2010; Kolominsky et al. 1999; Vdovenko 1999]. Additional research has examined potential effects on the respiratory [see, e.g., Füri et al. 2025; Kolpakov et al. 2011],

neurological, immune, and hematological systems [Titov et al. 1995; Svendsen et al. 2014]. Children's developing immune systems may be particularly sensitive to radiation exposure, with studies reporting changes in immune-cell populations and immune responses following childhood or prenatal exposure [Noshchenko et al. 2010; Noshchenko et al. 2002; Petridou et al. 1996]. Internal radionuclides do not behave like an external X-ray: radioactive iodine is actively concentrated by the thyroid; strontium-90 behaves chemically like calcium and can become incorporated into developing bones and teeth; and cesium-137 distributes through soft tissues. These biological pathways are central to understanding why age and development matter. While the evidence is not equally strong for every health effect or every level of exposure, **uncertainty about the magnitude of a risk is not evidence that the risk is zero.**

That is why the Linear No-Threshold (LNT) model remains essential to radiation protection. LNT recognizes that radiation risk increases with dose and that there is no scientifically established threshold below which exposure can be presumed completely risk-free. It does not claim that every tiny exposure will produce a measurable effect in every individual; rather, it provides a prudent framework for protecting populations when risks at very low doses cannot be measured with certainty. Because women and children can face different and potentially greater risks than the generalized adult population, scientific uncertainty should not be used to assume that low-level exposure is harmless. When exposure is unnecessary, it should be reduced—not justified by the absence of proof of harm. The NRC should retain LNT and strengthen radiation protections rather than shifting the burden of uncertainty onto those least able to bear it.

When the stakes include lifelong health, reproductive health, and the well-being of future generations, prudence demands stronger safeguards, not weaker ones.

5. EXPOSURE TO IONIZING RADIATION HAS DISPROPORTIONATE IMPACTS FOR GIRLS AND WOMEN

For decades, exposure to ionizing radiation was understood as having a uniform effect on exposed populations – meaning that the accepted theory was that everyone who was exposed had an approximately uniform risk of developing negative health consequences from exposure.

But in 2006, the National Academy of Sciences – BEIR VII report provided the raw data that revealed that the effects are not uniform, and that women and children suffer disproportionate harm from ionizing radiation exposure. Research by Arjun Makhijani and colleagues in 2006, and subsequent independent analysis by Mary Olson in 2011 illuminated these findings (see also Makhijani et al. 2007, Makhijani 2009 [2008]; Olson 2019).

Today, the disproportionate impacts of ionizing radiation are well documented and the reality of disproportionate harm to girls and women has been widely accepted at the United Nations and by other international bodies. Nevertheless, radiation protection guidelines in the United States have continued to rely on an outdated model called "Reference Man."

Radiation models, such as Reference Man, which represent radiation impacts to human health via an all-male population model of (near) same-age workers, are not representative of the

majority of the population in the US. This model excludes *most* men, it *cannot* accurately represent radiological harms to children who are more susceptible to harm, and it *does not* factor in the disproportionate impacts of radiological harm to women. The current NRC protection guidelines continue to rely on this model, which means that they are already insufficient in terms of offering adequate health protections for the vast majority of the population, but especially for women and little girls.

We now have robust evidence of the disproportionate impacts of ionizing radiation on girls and women. We know that biological sex and age at time of exposure are *independent and compounding* factors in radiation harm [see Olson and Nichols 2024; see also European Commission 2021; Utada et al. 2021; Narendran et al. 2019]. We also know that little girls, between the age of 0 and 5 years old, are the most impacted post-birth life stage from exposure to ionizing radiation. Radiation outcomes are not uniform, despite the "same level" of exposure: scientific evidence demonstrates that radiation causes more cancer, more heart disease, and more stroke in women over the course of the lifetime than in men who are similarly exposed [Bracelet et al. 2016; Gillies et al. 2017; Little et al. 2023; Matthews et al. 2013; Ozasa et al. 2012; Preston et al. 1994; Sadakane et al. 2019]. But the impacts go well beyond this: immune dysfunction [Cassatt et al. 2023], pregnancy impacts [Folkers 2021], osteoporosis and impacts to the bones [Willey 2008; Willey et al. 2011] and other health effects have all been linked to radiation exposure, and they affect some populations more than others [see, e.g., Grant et al. 2021].

The NRC must therefore ensure that this well-established evidence regarding age- and sex-dependent risk is fully reflected in its radiation protection standards, particularly when evaluating policies that could increase or permit additional exposures to women, children, and other vulnerable populations.

6. INCREASED RISKS TO MEDICAL CAREGIVERS AND THE PUBLIC

The NRC has proposed weakened protections for those exposed to radiation through proximity to patients treated with nuclear medicine therapies. This includes a proposed tenfold increase in exposure for caregivers of patients released with radiopharmaceuticals, up to 5 rem per patient administration regimen. This is an alarming increase, equivalent to the proposed maximum *annual* occupational dose for nuclear workers, but compared with workers, family members who serve as medical caregivers lack the equivalent safety training and radiation monitoring. Such caregivers could include vulnerable individuals, such as pregnant women, and there is no provision for protecting or monitoring the exposure of others in the household, including children. It is indefensible to suggest that caregivers are able to freely provide their informed consent for such worker-level doses, to themselves and their families, in the midst of an emotionally overwhelming medical treatment. This proposal also allows for a significantly increased cumulative exposure to caregivers and families of patients who receive more than one regimen of radiation, caregivers of patients facing even more stressful repeat treatments.

In addition, the NRC's proposal extends the increased risk of exposure to members of the public who are likely to come into contact with the patient. This could include neighbors,

especially in apartments and high-density housing, and also to hotel workers, rideshare drivers, and others. These individuals would be exposed to increased radiation outside a controlled area, with no training or monitoring, and without their knowledge or consent. The NRC has provided no justification or quantification of benefits to patients, medical providers, or the public that would outweigh these significantly increased risks.

7. LEGACY EXPOSURES CREATE COMPOUNDING HARM AND HIGHER RISKS OF NEGATIVE HEALTH CONSEQUENCES

Recent research by Philippe et al. (2026) documents the widespread dispersal of radioactive fallout from nuclear weapons testing across the United States, demonstrating that the legacy of nuclear weapons production and testing persists in the form of radioactive contamination in our environment, including in our soil and groundwater. This legacy of contamination also extends beyond nuclear weapons testing. Radioactive materials have also been released or remain present at and around nuclear power facilities, uranium mines and mills, reprocessing facilities, waste sites, and other industry sites (see, e.g., Alwadi et al. 2026).

This contamination will remain in our environment for generations, producing what environmental historian Rob Nixon and others have described as a form of slow radiological violence—harm that unfolds gradually over years and decades and is often rendered invisible or is overlooked in public and regulatory discourse (Nixon 2011).

Research by Marco Kaltofen and Phil Plato (2024) highlights the significant risks associated with internal exposures resulting from the ingestion or inhalation of radioactive materials through contaminated food, water, and air. These exposure pathways are particularly consequential because while an individual may experience a relatively low average external dose of ionizing radiation exposure, they may simultaneously receive biologically significant or even fatal internal exposures. Importantly, Kaltofen and Plato demonstrate that the risks of internal exposures are *orders of magnitude more harmful* than is currently represented in the data used to inform our current radiation protection guidelines.

This information is critical when we consider the need for radiation protection standards that account for the realities of living in an environment where radioactive contamination is already present and where exposure can occur through multiple, cumulative pathways. Multiple exposures do not just mean that the risk of harm doubles: Impacts from multiple exposures are not linear. Rather, multiple exposures means compounding harm, and the more exposures a person has the more likely they are to suffer the risk of negative health consequences. This risk is also higher when those exposures happen closer together, or in quick succession. This is why the proposed changes to worker dose limits are so problematic: not only is the NRC planning to double the allowable does that any worker can get in a year, but they suggest that if the full amount of exposure from year one is not used, it can simply be rolled over to the following year, allowing for more exposure in quick succession in year two. This matters for all industry workers who encounter radiation in their jobs, for whom the risk of compounding impacts will be significantly higher.

Moreover, it is critical to consider the compounding impacts on communities who have already borne the brunt of our radioactive legacies in the US. This includes Indigenous

communities and other marginalized groups across the US that have historically been targeted by the nuclear industry for mining, waste storage, and nuclear power facilities and that have already experienced high levels of radioactive contamination and harm from exposure. These communities are even more at risk from this new rulemaking, which will raise the likelihood of additional, compounding exposures and negative health consequences, should this rulemaking move forward.

Radiation protection standards must therefore be grounded not only in theoretical dose calculations, but in the best available evidence concerning the actual health consequences experienced by people living, working, and raising families in the United States.

8. PROPOSED REGULATIONS ARE A KEY EXAMPLE OF INDUSTRY PROPAGANDA AND RECKLESS DENIAL OF THE FACTS

On December 8, 1953, President Dwight D. Eisenhower delivered his "Atoms for Peace" speech at the United Nations, "to hasten the day when fear of the atom will begin to disappear from the minds of the people" [Eisenhower 1953]. This commenced what Tommy Song in *Time Magazine* called "part of a larger public relations campaign…crafted to garner public support for the government's expansion of its nuclear arsenal in the arms race against the Soviet Union and to downplay perceptions of the U.S. as a bloodstained empire" [Song 2023]. Song noted:

> "The stunt largely worked. Atoms for Peace and subsequent public relations campaigns circulated two lasting images that have been reproduced to this day: one of the U.S. as a peace-seeking nation, not a warring empire, and another of nuclear energy as a source of life, rather than as an instrument of death." [Song 2023]

During the Cold War years, the U.S. government pursued nuclear supremacy, a well-orchestrated undertaking driving the promotion of nuclear energy as necessary and even beneficial while obscuring the underbelly of evidence for the conclusion acknowledged by the Federal Radiation Council in a 1962 Report: "Any radiation is potentially harmful…it is virtually certain that genetic effects can be produced by even the lowest doses" [Federal Radiation Council 1962, p. 2; see also Gofman and Tamplin 1969]. Uranium extraction and nuclear bomb testing inflicted widespread suffering on Indigenous peoples, people of color, and poor people around the world.

There were early warnings about the human health impacts of radiation exposure to humans, dating back to the Manhattan Project. Data had begun to emerge about the human health risks associated with ionizing radiation by 1947. Studies documenting the impacts to children and pregnant women from fallout from atmospheric nuclear weapons testing and evidence of high rates of lung cancer in Navajo Uranium mine workers offered prescient warnings about the health consequences of radiation exposure [see, e.g., "New Mexico Summary of Vital Statistics, 1945" 1947; Reiss 1961; Brugge et al. 2007; Brugge and Goble 2002]. Despite this early evidence, the human health impacts of ionizing radiation have been largely ignored when it comes to setting radiation protection guidelines in the US. Today the U.S. nuclear regulator is again a nuclear power promoter, willing to continue the sacrifice of those most vulnerable by establishing a cost/benefit analysis that highlights the "benefit" of cost savings for the industry

while setting aside the cost to public health as incalculable, therefore not part of the relevant equation.

In 2011 after Fukushima, Rudi Nussbaum, Professor Emeritus of Physics and Environmental Sciences at Portland State University, issued a press release asserting that:

> "those who deny or deceptively play down the catastrophic threats to public health from all phases of the nuclear power cycle… recklessly ignore the medical/scientific lessons we should have learned from current and previous nuclear accidents." [Nussbaum 2011]

Nussbaum called out the reality of "unacceptable long-lasting effects on public health" by nuclear arms and nuclear energy production, asserting that "in agencies that are mandated to protect public health, a mindset that denies reality is intolerable" [Nussbaum 2011].

This "modernizing" radiation rulemaking under way is accompanied by the same public relations approach that has pushed nuclear power forward for decades, assuring the public that nothing has changed while providing a "framework" for radiation exposure that increases radiation pollution to benefit the industry while worsening public health exposure outcomes for workers and the public.

This proposed rulemaking is a fitting example of the "reckless denial of reality" charge Nussbaum made 15 years ago, as the NRC *still* fails to heed the evidence of medical and scientific experts. Given that the recently revised Mission Statement of the Nuclear Regulatory Commission begins: "The NRC protects public health and safety…"[2] it is clear that the betrayal of workers and the public will continue. As Rudi sadly noted: "Vested political and financial models, cherished theoretical models, mixed with intolerable arrogance, again trump reality."

9. BURDEN OF PROOF

Humans and other living entities are impacted by ionizing radiation via multiple exposure pathways - inhalation, ingestion, surface contact and proximity to source. Based on the LNT model, which these draft rules claim to maintain, all exposures increase the risk of harm. Thus, less exposure means less harm.

The nuclear enterprise has added vast amounts of ionizing radiation to our environment along the entire uranium fuel chain, in what is essentially now an unplanned, uncontrolled, and undocumented human experiment about the effects of ionizing radiation on the earth's biosphere - that sacred place where life takes place on this planet.

Recent research shows associations of harm with proximity to operating nuclear reactors, inviting further study to pursue proof of causation [Alwadi et al. 2025, 2026]. The lack of scientific certainty, acknowledged by the NRC, should lead the agency to take extra caution (often referred

[2] NRC Approves Updated Mission Statement, 20205. https://www.nrc.gov/cdn/doc-collection-news/2025/25-005.pdf

to as the Precautionary Principle) in setting exposure standards, rather than the proposed path of less caution by allowing greater exposure.

When we do not fully know things, this is when we need to be more careful. It seems ludicrous to argue that if our knowledge about the health effects of low levels of radiation is so lacking that we cannot set definitive standards, that we then should allow more exposure. It appears that the NRC reasoning is that because the NRC doesn't really know what the impacts are, that the NRC concludes that this ignorance gives license to allow more exposure. *This reasoning is upside down*. Before increasing exposure, it should be the responsibility of government and industry to definitively prove that there are no ill effects from any contemplated release(s). If there is demonstrated or potential harm, then there must be public, transparent, NEPA-like discussion of the costs and benefits of increasing the load of ionizing radiation in our biosphere.

The recently refreshed NRC mission statement says that the NRC is to protect public health. The Draft Rule states that LNT is maintained (what you say) but then orders the removal of ALARA from the rules and industry practices (what you do). In 1974, Nixon's Attorney General John Mitchell advised the public to not "judge us by what we say, judge us by what we do." This is sound advice today.

In this case, the NRC's duplicitous actions, serving political rather than scientific or public interests, undercuts the NRC's standing in many state, national, and international governmental and professional bodies, causing untold unintended consequences and costs. The NRC used to be considered the world's 'gold standard' of radiation protection and regulation; such leadership, influence, and respect is in great danger if NRC adopts political rather than scientific protocols.

10. Gold Standard Science

Executive Order 14300 calls for "Gold Standard Science"[3] in the new revised NRC rules. This requires them to be reproducible, transparent, communicative of error and uncertainty, collaborative and interdisciplinary, skeptical of findings and assumptions, structured for falsifiability of hypotheses, subject to unbiased peer review, accepting of negative results as a valid, with publishable outcome, and conducted free from conflicts of interest.

In terms of the proposed rulemaking, the NRC is violating the common sense understanding which is to include up-to-date and comprehensive research in calculating the risks from ionizing radiation. To do this, the NRC should expand its endpoints for harm to include more than cancer—to include other diseases and ailments known to be caused by ionizing radiation, including heart disease, stroke, and reduced immunity. There also needs to be work done on the dose-response relationship but for a truly gold-standard regulation, that work must be undertaken.

These known health consequences cannot be completely ignored when increasing allowable exposures, doses, dose-rates, and releases. Research documenting these health

[3] https://casrai.org/guides/gold-standard-science-executive-order

detriments in addition to cancer are included in the UN report on Gender and Ionizing Radiation [Nichols and Olson 2024].

The NRC should center protections on those most harmed from exposure, in accordance with the disparate impacts revealed in BEIR VII of the National Academies of Science. If we protect those who are most at risk from exposure to ionizing radiation, we can protect everyone better.

PART II

RECOMMENDATION FOR BETTER PROTECTIONS FROM THE COALITION TO STOP RADIOACTIVE POLLUTION

In light of the concerns outlined above, we offer below some specific recommendations for strengthening public health protections and safety standards for workers and the public. We urge the NRC to give these recommendations serious and substantive consideration.

1. RETAIN THE LNT

We urge the NRC to retain the LNT model in their final rulemaking as the appropriate foundation for radiation protection guidelines. The LNT model reflects the weight of scientific evidence supporting the conclusion that the risk of stochastic health effects from ionizing radiation increases with dose and that, even at low doses, no threshold below which risk can be assumed to be zero has been reliably established. Given the serious and potentially irreversible consequences of radiation-induced cancer and non-cancer related disease outcomes, uncertainty about the magnitude of risk at low doses should not be used as a basis for assuming that such risk does not exist. Retaining the LNT model is necessary to help provide a scientifically grounded and appropriately precautionary framework.

We hold that this is the *bare minimum* for what is necessary to prevent *even higher levels* of radioactive environmental pollution and to protect workers and the public from *even more* radiological violence and suffering.

2. RETAIN THE ALARA STANDARD

We further urge the NRC to retain the As Low As Reasonably Achievable (ALARA) principle as a foundational component of its radiation protection framework.

There is no safe dose of exposure to ionizing radiation. All exposures carry the risk of harm which can express in the form of both cancer and non-cancer related health impacts. These

impacts can manifest at any point in the lifecycle after exposure takes place, and it sometimes takes years or even decades before negative health consequences appear (see, e.g., Nadler and Zurbenko 2014).

All science includes uncertainty, but there is in fact strong evidence of cancer and other health harms at the "low dose range," and especially at cumulative low doses over time [see, e.g., Cologne et al. 2019; Gofman 1990; Hwang et al. 2008; Richardson et al. 2023; United Steel Workers International 2026]. As Richardson et al. wrote:

> "The summary estimate of excess relative rate solid cancer mortality per Gy is larger than estimates currently informing radiation protection, and some evidence suggests a steeper slope for the dose-response association in the low dose range than over the full dose range." [Richardson et al. 2023]

These impacts are known to be more harmful to particular populations, including women (especially pregnant women) and children. Because of this evidence, modernization of radiation exposure standards should be strengthened, not weakened.

Compliance with a numerical dose limit does not eliminate the risks associated with ionizing radiation; rather, dose limits establish an upper boundary, while ALARA requires exposures to be minimized whenever reasonably achievable. This distinction is especially important given the uncertainty surrounding the magnitude of stochastic health effects at low doses. Such uncertainty should warrant greater precaution, not weaker protections.

Retaining ALARA ensures that radiation protection remains focused not merely on keeping exposures below regulatory limits, but on actively preventing and minimizing unnecessary exposures.

3. STOP RADIOACTIVE ENVIRONMENTAL POLLUTION AND END THE LEGACY OF RADIOLOGICAL VIOLENCE AND INJUSTICE

We urge the NRC to move beyond managing the consequences of radioactive contamination and instead take meaningful action to stop radioactive environmental pollution and end the ongoing legacies of radiological violence and injustice that have been persistent in the US for the past century.

The Nation's radiation protection framework must recognize that radioactive environmental pollution remains in our environments, in our soil and groundwater, for thousands – and in some cases even millions – of years. Environmental contamination can, therefore, persist across generations, affecting both current and future generations long after the activities that produced that contamination have ended.

The NRC must also account for the distinct risks posed by internal exposures to ionizing radiation, which occur when radioactive materials are inhaled or ingested through contaminated air, food, or water. The current radiation standards dramatically underestimate the risks from internal exposure and are not based in the reality of health consequences to real people living in an *already* contaminated world. Adding more radioactive environmental pollution to our

environment not only affects the air we breathe, the food we eat, and the water we drink, but increases the risk of high-level internal exposures for the general public. The NRCs radiation protection frameworks must therefore address not only external exposure, but all of the distinct environmental pathways through which radioactive contamination can enter the human body.

We hold that the NRC should prioritize preventing unnecessary releases and exposures, strengthening protections for disproportionately affected individuals and communities.

4. IMPLEMENT BETTER PROTECTIONS BASED ON THE MOST UP-TO-DATE, PEER REVIEWED SCIENTIFIC RESEARCH

Given that the NRC's states that "the proposed changes are based on… the current state of scientific knowledge using a weight of scientific evidence decision-making approach, as described in E.O. 14303, 'Restoring Gold Standard Science'" we would expect to see the NRC incorporate and cite the most recent, independent, peer-reviewed, high-quality scientific evidence in their proposed rulemaking. However, this is not the case.

The NRC continues to rely on outdated models and industry supported "evidence" when establishing radiological protections guidelines. This constitutes massive failure on the part of the NRC, which has a responsibility to ensure that its regulatory framework keeps pace with advances in scientific knowledge and reflects the strongest protections reasonably supported by the evidence. This responsibility is particularly important where emerging research continues to illuminate that the risk of harm from ionizing radiation has been *dramatically underestimated*, and that there are disproportionate, compounding, and intergenerational consequences of exposure.

The *only* appropriate response to such evidence is to minimize unnecessary exposure and to strengthen protections, to help protect and safeguard the health of workers, the public, affected communities, and future generations. **We urge the NRC to strengthen its radiation protection standards based on the most up-to-date, peer-reviewed scientific research and the full weight of available scientific evidence. Radiation protection regulations should reflect the best and most current understanding of the health consequences of ionizing radiation, including evidence concerning low-dose and low-dose-rate exposures, the disproportionate health consequences of exposure, the elevated risks associated with compounding and internal exposures.**

5. ADOPT THE RISK-BASED REGULATIONS THAT INFORM CURRENT EPA STANDARDS

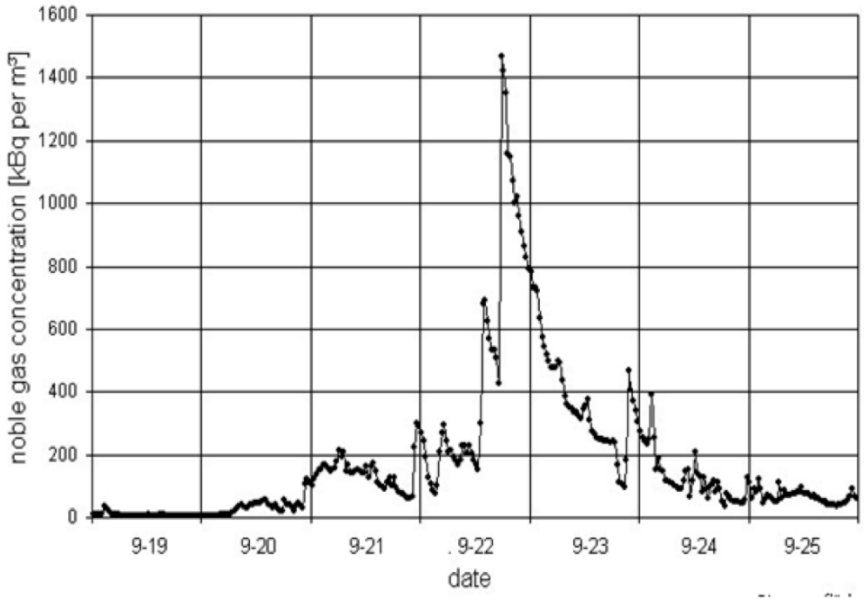
NRC should adopt the risk-based regulations that inform the current EPA standards and apply these to civilian nuclear operations. The NRC does not have the authority to purposefully expose the people in this nation to excess radiation or to excess radiological outcomes compared to another more protective federal regulator. Nuclear activities and materials are restricted and licensed because they are dangerous.

Allowing a much greater percentage of the US Population to be exposed to radiation that will produce disease rates 70 times greater than another agency is irresponsible, immoral, and it gambles with the future of all life on this planet, particularly that of humans.

6. REQUIRE INDEPENDENT AND REAL-TIME FACILITY, WEATHER, ENVIRONMENTAL, AND BIOLOGICAL MONITORING WITH REAL-TIME PUBLIC REPORTING

Public health requires monitoring of radioactive releases. Estimates of what public exposure might be aren't good enough because they rely on assumptions that are not protective of everyone, especially women, pregnancy, and children. Monitoring of environmental releases, weather patterns, and subsequent contamination is necessary, but should be combined with biological monitoring of exposed individuals to determine who is being exposed and to how much. Science offers these reliable monitoring methods. The NRC should be required to make use of them if their goal is actually protecting public health.

Radiation is released routinely from nuclear reactors, but there is evidence that BWRs release radioactive pollutants in spikes, as well as more routinely or through leaks. Noble gases such as radioxenon and radiokrypton, and radionuclides like carbon 14 and tritium, are all released as radioactive pollution. Pictured below is a graph from a single German boiling water nuclear power reactor, Gundremmingen C, now shut down and decommissioned. The data in this graph represent real-time, official government data, not averaged data. Note that during the time period represented by this graph, the lowest daily release was about 3 kilobecquerel per meter cubed of just noble gases, still hundreds of times higher than natural radioactivity in air from radon in most places [Fairlie 2014].



Noble gas concentrations at Gundremmingen C, September 19-25 (1)

Since the United States also has several operating BWRs, there is no reason to believe that reactors in the US don't release radioactivity in spikes as well during refueling outages and routine maintenance. Emissions data in the US are also given as an average where these spikes could be routinely smoothed out, and these data are often published months after the measurements are taken.[4]

Timing matters during pregnancy and the sensitive and unique developmental processes that are occurring. The people living in the US deserve to know what is being released *in real time*. While fat soluble noble gases are represented in this graph, radionuclides like carbon 14 and tritium are also released during normal reactor operations and represent unique dangers during pregnancy development as both are chemically the same as their non-radioactive counterparts. Both carbon and hydrogen are basic building blocks of the human body. Each can collect in fetal tissue at twice the concentration that they can in maternal tissue [ICRP 2001]. In the U.S., we need independent, real-time monitoring of the releases directly from all effluent points of the facility, but also weather pattern monitoring and environmental sampling.

Exposure from internal and external radioactive pollution can often leave traces behind. These traces, in the form of malformations, can also be observed and measured. In a number of cases, these malformations are not only associated with exposure to radioactivity, but also with increased disease risk from that exposure [Nickoloff et al. 2008; Mackinnon and Campbell 2011; Kwon et al. 2020]. Many of these malformations have a role in cancer initiation and progression and can be hallmarks of non-cancer diseases. And while some biomarkers may be caused by exposures other than radiation, certain biomarkers have already been used to reconstruct historic radiation exposure in individuals, from radium dial painters to inhabitants around normally operating reactors [Wald et al. 1963; Wing et al. 1997; Livingston et al. 1997; Schmitz-Feuerhake et al. 1997].

We urge the NRC to require independent, real-time monitoring and real-time public reporting of facility operations, weather conditions, environmental contamination, and biological exposures to ensure that radioactive releases and pathways of exposure are detected promptly, accurately, and transparently, rather than relying primarily on licensee-generated data and periodic sampling. Such monitoring would provide an independent evidentiary basis for identifying releases, tracking their movement through the environment, protecting affected communities, and enabling timely intervention when contamination or exposure occurs.

The NRC already recognizes environmental monitoring as an important means of verifying radioactive releases and their impacts. Making independent, continuous monitoring a requirement is a logical strengthening of that protective framework.

[4] Radioactive Effluent and Environmental Reports by calendar year, Nuclear Regulatory Commission. https://www.nrc.gov/reactors/operating/ops-experience/tritium/plant-info

CONCLUSION

We believe that all planetary citizens have the inalienable human right to a clean and livable environment, and the right to informed consent about the potential of increased levels of exposure to radioactive pollution in their workplaces, environments, and in the food and water they consume. If it moves forward, we believe that this rulemaking will have catastrophic impacts in terms of public health for *everyone* living in the US. We implore the NRC to act with all due diligence in this matter, and to abandon any efforts to pursue this proposed rulemaking further.

Sincerely,

Coalition to Stop Radioactive Pollution

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