

June 24, 2015

ATTN: Rulemakings and Adjudications Staff
NRC Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Re: Comments on Proposed Rulemaking for Radiation Protection
(Docket ID No. NRC-2009-0279)

Research shows our cells and DNA are more vulnerable to ionizing radiation than previously thought – especially in embryos, infants and children – so exposure limits should be for lower concentrations of radionuclides in our environment and for lower ALARA (As Low As Reasonably Achievable) doses to workers and the public. Any changes to radionuclide limits should strengthen, not weaken, the current NRC regulations. We ask that you adhere to the standards of science, and not slacken NRC standards for protecting U.S. citizens from exposures to ionizing radiation.

The NRC's mission is to protect the people of our country from toxic radiation exposures and to protect the environment that sustains us from the long-lived damage that ionizing radiation is known to cause to the structure of DNA and the gene pool of living organisms. Because ionizing radionuclides are among the most toxic pollutants known to man, some remaining harmful for millions of years, and because we know that they can damage us at even the smallest doses, we call on you to adhere to protecting the people, not the industry, with your dose standards.

As an Agency charged with protecting the people and the environment of the United States, one specific way that we ask that you protect the public is for you to adhere to verifiable dose exposures, not statistical risk scenarios. This is not accident risk analysis, this is verifiable health science. The NRC should only express radiation exposure limits in terms of scientifically verifiable radiation dose exposures, NOT the more easily manipulated risk probability scenarios.

According to the NRC Advanced Notice of Proposed Rulemaking on Radiation Protection (Docket ID NRC-2009-0279), you proposed updating your standards to align with the "dose assessment methodology and terminology" of ICRP Publication 103, which was a 2007 update to the previous 1991 ICRP standards. We think it is important to point out that the 2007 ICRP 103 was published before the extremely important 2008 KiKK Study commissioned by the German government, which adhered to excellent dose methodology and which found a 1.6 increase in the relative risk of total cancers and a 2.2 fold increase in leukemias among children under 5 years of age living within 5 km of all 16 Nuclear Power Plants in Germany. ¹

¹ Peter Kaatsch, Claudia Spix, Irene Jung, Maria Blettner, "Childhood Leukemia in the Vicinity of Nuclear Power Plants in Germany," *Deutsches Ärzteblatt International* | *Dtsch Arztebl Int* 2008; 105(42): pg. 725.

Multiple major studies followed in the wake of the KiKK Study and the Table 1 chart of subsequent findings below should provide sufficient evidence to persuade the United States Nuclear Regulatory Commission that the threat to our children is real, and that basing any decisions on estimated, rather than observed, real-time data can no longer be supported.²

Table 1
Studies of observed (O) and expected (E) leukemia cases within 5 km of NPPs.

Dataset	O	E	SIR = O/E	90%CI	p-value
Germany	34	24.1	1.41	1.04–1.88	0.0328
Great Britain	20	15.4	1.30	0.86–1.89	0.1464
Switzerland	11	7.9 ^a	1.40	0.78–2.31	0.1711
France ^b	14	10.2	1.37	0.83–2.15	0.1506
Pooled data	79	57.5	1.37	1.13–1.66	0.0042

^a derived from data in [Spycher et al. \(2011\)](#).

^b acute leukemia cases.

From our own U.S. National Academy of Sciences Report on “Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII - Phase 2,”³ we know that women and children are far more vulnerable than previous standards have reflected and we also know that the excess cases of cancer following exposure is considerably higher than previously estimated.

Below is a graph from the BEIR VII report showing radiation-associated risks of leukemia cancer mortality regardless of gender, if a person is exposed to 1 Sv at age 10 years old (solid line), 20 years old (dashed lines) and 30+ years old (dotted lines) over time. Clearly, any EPA changes in exposure limits must use the FGR 13 and BEIR VII reports for data and recommendations in choosing methods of research and reports to the public.

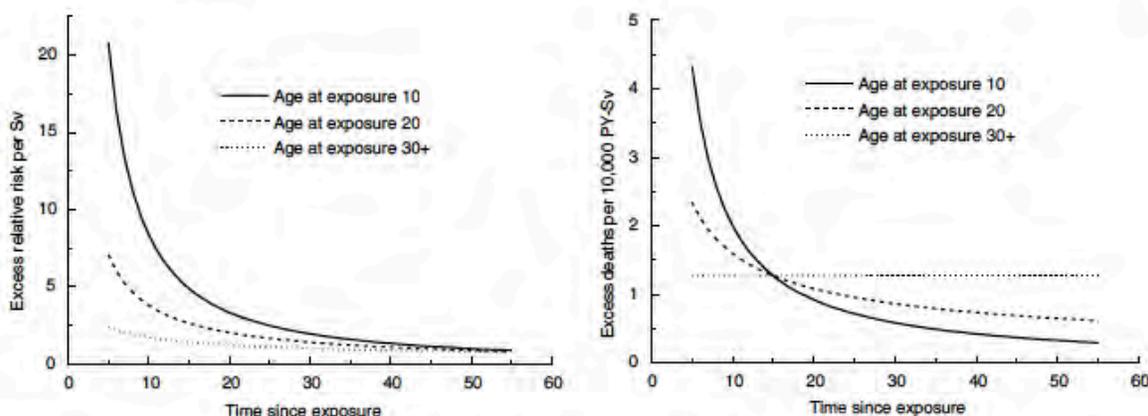


FIGURE 12-2 Age-time patterns in radiation-associated risks for leukemia mortality. Curves are sex-averaged estimates of the risk at 1 Sv for people exposed at age 10 (solid lines), age 20 (dashed lines), and age 30 or more (dotted lines). Estimates were computed using the parameter estimates shown in Table 12-3.

² Ian Fairlie, “A hypothesis to explain childhood cancers near nuclear power plants,” *Journal of Environmental Radioactivity*, 133 (2014) 10e17, pg. 11. <http://dx.doi.org/10.1016/j.jenvrad.2013.07.024>

³ National Academy of Sciences, *Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII - Phase 2*, National Academies Press, 2006, pg. 275.. <http://www.nap.edu/catalog/11340.html>

Arjun Makhijani and his colleagues make a strong and compelling case for reexamining some assumptions used to determine dosimetry methodologies and dosage standards. One assumption they challenge is the traditional use of a Reference Man, without accounting for dosages to women and children. Here you can see a “Women and Children First” effect, showing our ALARA dose standards are sacrificing them first.

In 1999, the EPA’s Federal Guidance Report 13 (FGR-13) concluded that the cancer mortality risk due to radiation exposure was 48% higher for women than for men. The 2006 BEIR VII report found the mortality risk to be 37.5% higher for women than for men., and Figure 2 illustrates just how high the risk is for children, especially females.

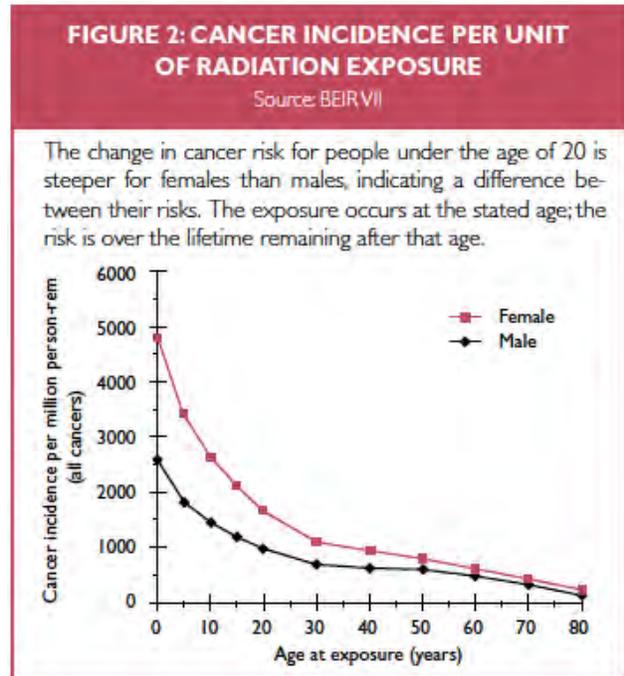
“Considering cancer incidence makes the differences between men and women even more pronounced. In FGR-13, the EPA estimated that women would be 58 percent more likely to develop cancer than men for the same level of exposure. The BEIR VII Committee estimated the figure at 52 percent.” (See Figure 1.)⁴

A 2013 Biomedical Journal article, “Long Term Local Cancer Reductions Following Nuclear Plant Shutdown,” states:

‘Children age 0-2 and 2-16 years have been estimated to be 10 and 3 times more sensitive to radiation exposure, respectively, than adults. The developing fetus undergoes rapid cell proliferation, self-programmed cell death (apoptosis), and cell rearrangement. The developing infant is similarly susceptible to cellular and metabolic damage. Unrepaired damage becomes magnified with time.’⁵

Clearly, the risks are far higher than previously thought, and any changes in radiation dose standards should reflect this information and should lower the ALARA doses accordingly.

Unfortunately, we know that there are excess cancers among people exposed to ionizing radiation, but we seem to accept the suffering as a necessary consequence of doing business. We submit that given the decades of public subsidies and loan guarantees needed to keep the



⁴ Arjun Makhijani, Brice Smith and Michael C. Thorne, “Healthy from the Start: Building a Better Basis for Environmental Health Standards – Starting with Radiation,” Science for Democratic Action, Vol. 14, No. 4, February 2007, pg. 3. <http://ieer.org/wp/wp-content/uploads/2012/01/SDA-14-4.pdf>

⁵ Joseph J. Mangano and Janette D. Sherman, Biomedical International Journal, Vol. 4 No. 1, 2013, pg. 3. <http://www.bmijournal.org/index.php/bmi/article/viewFile/115/82>

Excess Cases of Cancer per 100,000 Exposed Persons

(Exposed at 30, Attained Age 60)

ALL SOLID CANCER

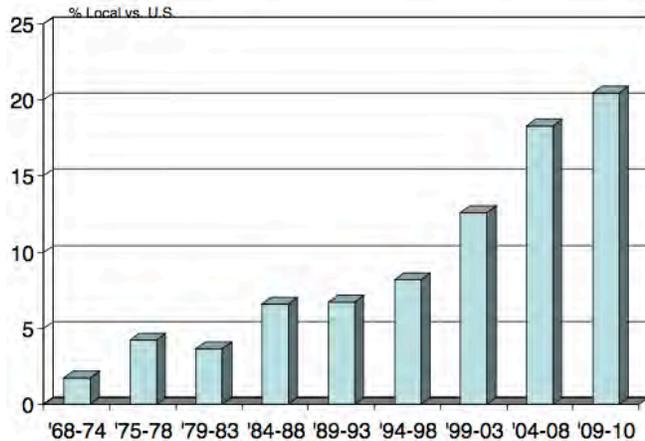
	Males	Females
Excess Cases from Exposure to 100 mSv	800	1300
Number of Cases in the Absence of Exposure	45,500	36,900
Excess deaths from Exposure	410	610
Number of Deaths in the Absence of Exposure	22,100	17,500

highly inefficient and costly nuclear industry afloat, given the unsolved problem of securing nuclear waste for hundreds of thousands of years, and given the known damage to living organisms DNA and gene pool, in addition to the immediate suffering of families and children – we submit that allowing any commercial radiation releases into our biosphere should be forbidden. Given that you will no doubt disagree with our assessment, we do ask that you increase protections for the public and our environment as much as you possibly can.

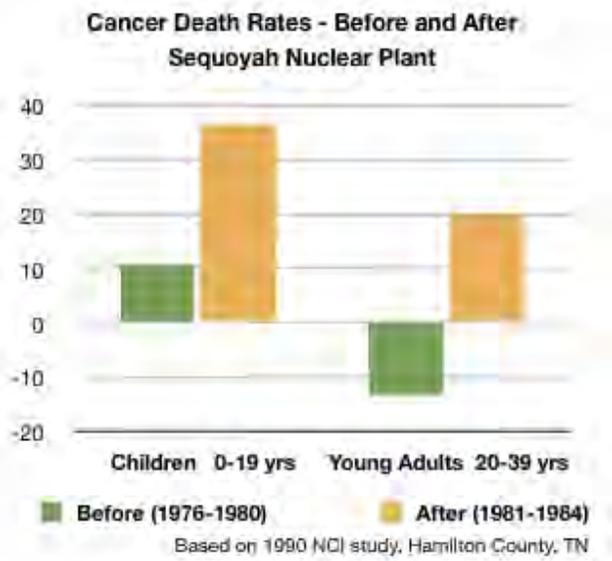
We think it is important to remind everyone considering these important issues surrounding radiation dose limits that these standards effect our communities. In the Tennessee Valley, where we are monitoring and studying the effects of nuclear power plants on our environment and the people of our valley, we have found some surprisingly strong evidence suggesting we should be lowering the amount of radiation released into our environment.

After Browns Ferry began releasing radionuclides into our environment, the mortality rate in seven counties near and downwind of the plant rose from under 2% to over 20% higher than U.S. rates as a whole. Even more disturbing, infant mortality in the seven proximate/downwind counties is 21.6% above the U.S. rate, a steady increase from the early 1990s, when it was below the U.S. rate. The excess is even higher for Hispanics (40.3%) and for whites (32.6%). Local mortality rates in the seven counties are especially high for young people. The rate for young persons who died at age 0-24 was 27.4%, and the rate for adults aged 25-44 was 25.7% higher than average U.S. communities.⁶

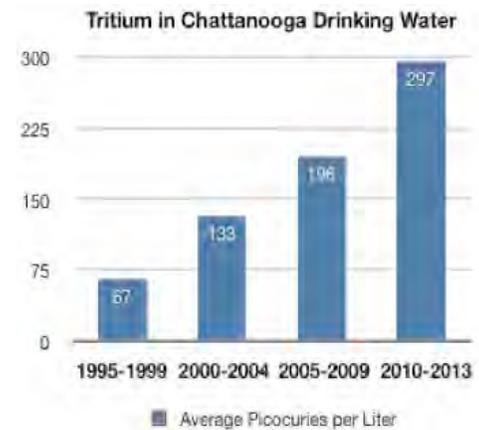
MORTALITY RATE, ALL CAUSES
7 Alabama Counties Downwind of Browns Ferry vs. U.S.
1968-2010



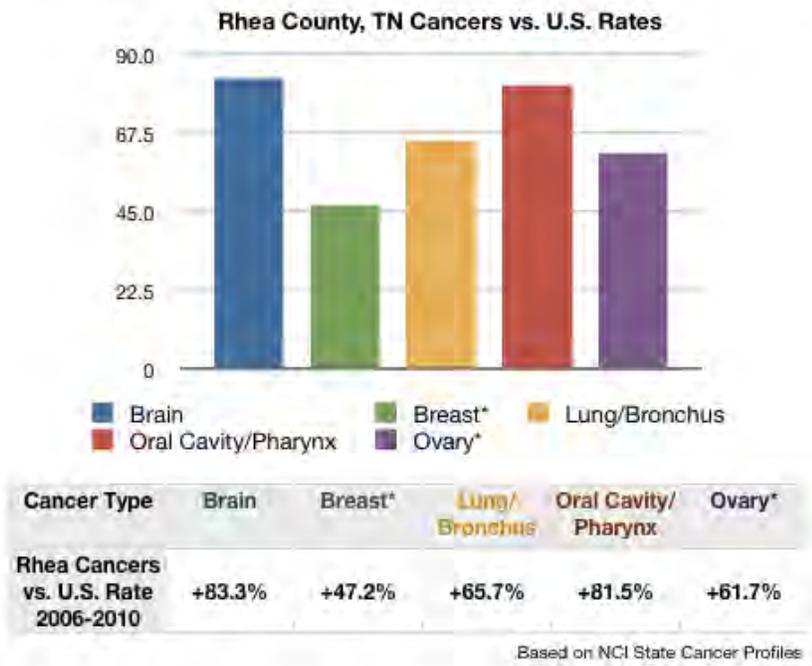
⁶ Joseph Mangano and Gretel Johnston, *Radioactive Emissions and Health Hazards Surrounding Browns Ferry Nuclear Power Plant in Alabama*, BEST/MATRR, June 4 2013. http://best-matrr.org/pdfs/AL_BFN_Report_2013-final-dig2.pdf



Following the start-up of the reactors at the Sequoyah Nuclear Power Plant,, cancer death rates in Hamilton County, TN, rose dramatically among young people. The population within 50 miles of the Sequoyah Nuclear Plant is well over one million, and the un-filterable tritium in Chattanooga’s drinking water has been rising steadily.

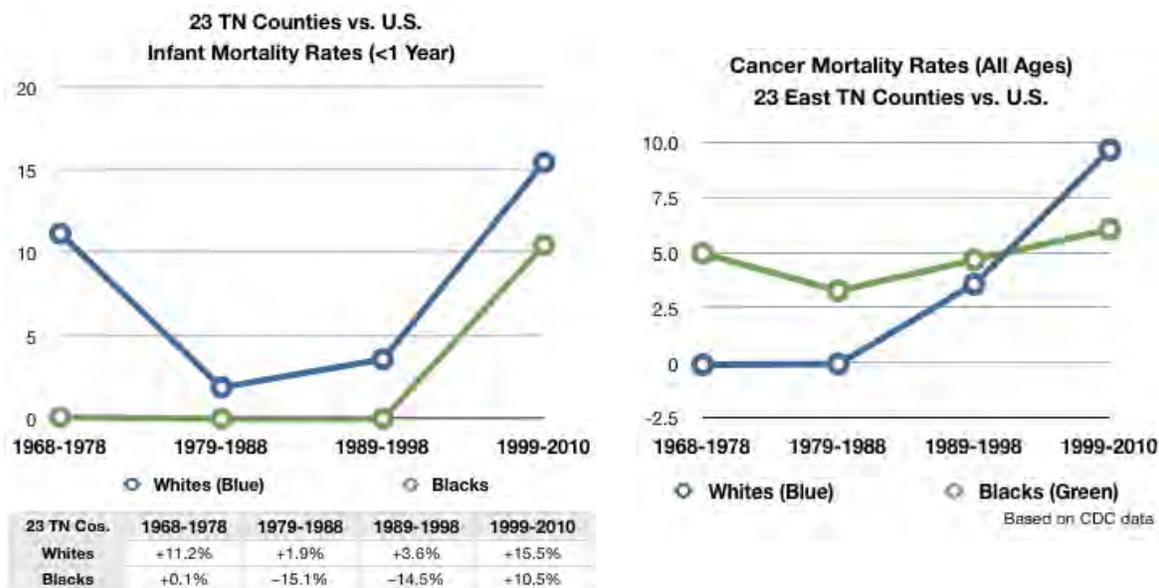


In Rhea County, which is near both the Watts Bar Nuclear Power Plant and the Oak Ridge Nuclear Reservation, we found the highest cancer rates in Tennessee, the highest cancer rates for all U.S. counties with populations over 24,000, and the 19th highest cancer rates of all 2,727 U.S. counties for which the National Cancer Institutes (NCI) reports (of 3,141 U.S. counties). Here is a breakdown of the Rhea County cancer types:



[Note: the above illustrations will appear in a forthcoming BEST/MATRR publication, *Radioactive Pollution and Health Risks from Nuclear Plants in East Tennessee* by Joseph Mangano, Garry Morgan, and Gretel Johnston.]

We found a classic Bathtub Pattern of infant mortality in all of the 23 counties we studied near or downwind of the Tennessee nuclear plants, and notable increases in cancer deaths for all ages.



Of course, we are not saying there is a direct causal relationship, since the data is not available to draw that conclusion, but we do think these patterns deserve further study and are worthy of note when discussing limits to radionuclide contaminants in our environment.

In Section III of your Advance Notice (Docket ID NRC-2009-0279), you state you are seeking "alternative approaches to ensure individual protection at or near the current dose limit." ⁷ In order to ensure you are adhering to the current dose limits, we propose that it is necessary to adequately monitor the amount of exposure, and that this is not currently being done and has not been done in the past. Fortunately, the good news is that this can now be done in real-time, uploaded to the internet, and analyzed in a far more cost effective manner than is currently being employed. (See examples at International Medcom, Inc., <https://medcom.com/>)

Because radioactive isotopes are energetic and unstable, the current method of measuring releases on a weekly, monthly or quarterly basis is highly inaccurate. In fact, the current quarterly averaging of effluent releases (and therefore assumed doses to the public), reported to NRC annually, are extremely inaccurate. According to specialist Ian Fairlie, during the brief periods of nuclear refueling, the "people living near and downwind from nuclear power stations may be exposed to higher exposures during these emission spikes than from releases during the rest of the year: estimates range from 20 to 100 times higher." ⁸

Averaging effluent exposures is an inaccurate and possibly hazardous assessment of actual dose exposures for the public. We have found, from our own real-time monitoring near nuclear

⁷ NRC, "Radiation Protection: Advance Notice of Proposed Rulemaking," ID: NRC-2009-0279-0067, July 25, 2014.

⁸ Fairlie, Ian, "A hypothesis to explain childhood cancers near nuclear power plants," *Journal of Environmental Radioactivity*, 133 (2014) 10e17, pg. 13. <http://dx.doi.org/10.1016/j.jenvrad.2013.07.024>

power plants in the Tennessee Valley, that exposures are sometimes 40 to 50 times higher than background radiation levels at a distance of 70 miles from the plant; and sometimes the exposure levels are higher at a distance from the plant, depending on weather conditions and possibly other factors.⁹

In our papers, "Make Radiation Visible," presented to Commissioners in 2014, and "Monitoring Matters,"¹⁰ we propose (1) real-time monitoring posted on licensees' websites, along with (2) a calendar of scheduled release dates (3) and refueling dates, and (4) all made available to the public online. There are no security issues involved here, since the data are simply the existing current levels of ambient radioactivity, scheduled effluent release dates, and refueling time periods. We contend that you cannot effectively regulate exposure levels if you do not know what those levels actually are at any given time. Averaging data is not anywhere near as accurate as measuring data in real-time for ionizing radiation dose exposures.

We applaud the proposed use of dose models for different age groups; however, we again point out that dose models are based on the fundamental data available for analysis. We suggest that your basis data is flawed and incomplete, if it is not truly comprehensive and gathered in real-time. We suggest that the "effective dose" cannot be calculated without accurate real-time monitoring data.

We also applaud and support the ICRP Publication 103 (2007) recommendation to lower the dose limit for pregnant workers to provide the unborn child with the equivalent protection of dose limits for the general public of 1mSv (100 mrem) during the term of declared pregnancy, although we think this should be reduced even further.. We also support further strengthening this Rule by providing this (or better) level of protection for the entire period of pregnancy, not just the legally declared period, and also we suggest providing equivalent pay (to avoid incentives for delayed declarations) even if the pregnant employee's work load is reduced during this period.

Here we quote the NIRS organizational letter submitted to you earlier this week:

"The NAS Biological Effects of Ionizing Radiation Studies (BEIR) V found radiation ~3-4 times more dangerous per unit dose than previously assumed and BEIR VII found cancer incidence risks 35% higher than BEIR V(1.141 x 10e-3 per rem). The European Commission on Radiation Risk2 (ECRR) report came out in 2003 enumerating the many ways the International Commission on Radiological Protection (ICRP, in which NRC plays a leadership role) underestimates and incorrectly calculates radiation risks including inappropriately using external dose information to extrapolate internal dose risk estimates without scientific foundation. The ECRR recommends "the total maximum permissible dose to members of the public arising from all human practices should not be more than 0.1mSv [10 mr], with a value of 5 mSv [500mr] for nuclear workers."¹¹ It appears NRC has not addressed these recommendations in any way. In addition, concepts such as the bystander effect and genomic instability have shown that mechanisms for harm exist that are not reflected in

⁹ Ibid, Mangano and Johnston, 2013, pg. 22. http://best-matrr.org/pdfs/AL_BFN_Report_2013-final-dig2.pdf

¹⁰ Susan Shapiro and Gretel Johnston, "Monitoring Matters," BEST/MATRR, Mar. 2014. http://best-matrr.org/MONITORING_MATTERS-g.pdf

¹¹ 2003 Recommendations of the ECRR, The Health Effects of Ionising Radiation Exposure at Low Dosed for Radiation Protection Purposes, Regulators' Edition, Published on behalf of the European Committee on Radiation Risk, Comite European sur le Risque de l'Irradiation, Green Audit, Brussels, 2003 (ISBN: 1 897761 24 4)

the ICRP models. Unfortunately our organization(s) was (were) not invited to the NRC meeting(s) on the radiation risk aspects of the rulemaking. " ¹²

Regarding the Radiation Protection Programs, we again call for more comprehensive real-time monitoring for workers and the public, to ensure individual and community protection from ionizing radiation doses. We applaud the recommendation for an ALARA Planning Program for control measures regarding immediate as well as multiple-year cumulative doses, and any measures to increase protection of the workers and public being exposed to these toxins. We support, as a maximum, alignment with the ICRP Publication 103 (2007) recommendation for an average dose over a 5-year period of 20 mSv (2 rem) as an administrative control level (ACL). We also think this could be strengthened with real-time cumulative occupational dose recordkeeping for all workers, as well as for the exposed public – through real-time online monitoring and subsequent analyses.

We know that radioactive contaminants are extremely complex, since they often transform into progeny in their attempts to stabilize; however, this does not diminish the health hazard posed by even the smallest of exposures to ionizing radionuclides. We also know that they can damage human cells and break both strands of the DNA chain in even the smallest known dosages. We therefore call on the NRC to reduce exposure limits, rather than ignoring the current studies showing more health consequences from exposures to ionizing radiation than previously thought. If the ALARA (As Low As Reasonably Achievable) limits are to be changed at all, they should certainly be reduced to protect the public, not increased to protect nuclear industry financial profits.

The proposals we make – to post real-time monitoring online, as well as scheduled release and refueling dates – are fairly simple and inexpensive measures that we hope the NRC will consider adding to their proposed Radiation Protection Rulemaking.

Our additional request that you lower the allowable radiation exposure dose limits is simply humane common sense, given current information on the harmful health effects of even extremely low doses.

We thank you for your careful consideration of our proposals, and for all of your good work to protect the people and the environment that sustains us all.

~ Submitted by Gretel Johnston for BEST/MATRR, June 26, 2015

via Email to Rulemaking.Comments@nrc.gov

Subject: Docket ID NRC-2009-0279

¹² NIRS, "Comments of Nuclear Information and Resource Service et al, June 24, 2014, on Nuclear Regulatory Commission (NRC) 10 CFR 20, [NRC-2009-0279] RIN 3150-AJ29 Radiation Protection, Advanced Notice of Proposed Rulemaking on development of a draft regulatory basis. 79 FR 143: 43284-43300 7/24/14," Rulemaking.Comments@nrc.gov, June 24, 2015, pg 3.