# Comments[1] on the Nuclear Regulatory Commission's Advance Notice of Proposed Rulemaking for 10 CFR Part 20[2]

**Harold T. Peterson, Jr.[3]**

**Q1–1: What are the implications of changing the NRC's regulations to specify ''total effective dose'' in place of the current term ''total effective dose equivalent?'' To the extent possible, please provide specific implementation and operational cost information on the impacts of this change relative to licensee procedures, training, recordkeeping, and reporting. This information is necessary for the NRC to determine whether the imposition of such requirements on NRC licensees is justified.**

**C*omment:*** *The question notes the areas that could be impacted by this change. Changing the terminology would have no substantive benefit in either health protection or improving consistency with guidance issued by the International Commission on Radiological Protection (The ICRP and NCRP do not use either the terms TEDE or TED. They use "effective dose" which does not inform the reader that both internal and external doses are included as does TED or TEDE.)*

*This change should have a smaller impact than the NRC's change from "deep dose equivalent" to" effective dose" in the definition of TEDE [72 FR 68043, December 4, 2007]. Despite this (and parental pride* in having participated in coining the term "TEDE"), I believe that the term "total effective dose" should be adopted in order to be consistent with the Department of Energy's use of TED in its 10 CFR Part 835 (§ 835.2) as amended (*72 FR 31904, June 8, 2007). *The exact definition used by DOE should also be adopted. The use of TED rather than TEDE would also better reflect the ICRP's monumental change (ICRP 60) from "effective dose equivalent" to "effective dose" which was the stated reason for the DOE change.*

* This commenter was the NRC Program Manager and Chairman of the staff Working Group that prepared the 1991 final Part 20 rule. The term "TEDE" was used by this group to avoid writing "the sum of the deep-dose equivalent for external exposure and the committed effective dose equivalent for internal exposures" multiple times as the ICRP (ICRP Publication 26, 1977) did not specify a unique name or symbol for this sum.

**Q1–2: If the NRC adopts the dose assessment terminology and methodology of ICRP Publication 103 (2007) in a future rulemaking, what time period should the NRC consider providing for implementation of the ICRP Publication 103 (2007) methodology and terminology?**

***Comment:*** *After the ICRP has completed development and publishing of the documentation to replace ICRP Publication 30. The implementation period should be at least one year.*

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[1] Questions where no response is given are those for which I have no comment or information to provide.

[2] 79 FR 43284, July 25, 2014

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**Q1–3: How should the calculations of effluent concentration, currently in the 10 CFR part 20 radiation protection regulations, be modified to reflect advances in modeling that are now available? In particular, the NRC is interested in preliminary views on the age and gender averaged approach.**

***Comment:*** *It is questionable whether such a small difference in effective dose warrants the added complexity of doing age-specific or age and gender averaged dose calculations. The use of age-specific dose models should not pose a problem as the NRC models that are used for environmental dose calculation: "Calculation of Annual Doses to Man From Routine Releases Of Reactor Effluents for the Purpose Of Evaluating Compliance with 10 CFR Part 50, Appendix I" Rev. 1 October 1977 and Regulatory Guide 3.51 "Calculational Models for Estimating Radiation Doses to Man from Airborne Radioactive Materials Resulting from Uranium Milling Operations" March 1982) have used age-specific dose models for decades.*

*Most occupational dose assignments are made on the basis of measurements, not calculations, so that gender-specific estimates are not likely to be a major issue.* ***However, the ANPR does not discuss whether NRC is considering gender-specific factors for occupational exposures such as for the conversion of gamma radiation dose measurements into organ or effective doses.***

***Using age and gender-averaged parameters only conveys the appearance of increased scientific rigor. The ability to model doses does not mean that the results accurately depict the real world:***

1. *The differences between age groups under the "effective dose" model is much less than it was using the "critical organ concept." Age-dependent or age and gender averaged dose models are less important now than they were before the current Part 20 was published in 1991.*
2. *The models used for gamma dosimetry for representative individuals of various age groups are mathematical constructs, not necessarily representative of actual individuals.*
3. *The intake and metabolic data used for internal dose calculations may not be representative for healthy North American individuals.*
4. *The dose-to-risk factors that are used with these doses are derived from diverse populations under widely different exposure conditions that may not apply to long-term low-level exposures of persons living in North America:*
    a. *Much of the risk information comes from acute exposures of Japanese atomic bomb victims.*
    b. *Thyroid risks are largely based on Marshallese Islanders exposed to atomic fallout.*
    c. *Bone risks are based primarily upon data from female radium dial painters.*
    d. *Lung cancer risks are derived from uranium miner radon data.*

***Given the above considerations, in my opinion, the added complexity and effort to use age and gender averaged values is not warranted and is only a pretense to make dose and risk calculations appear to be more accurate. I suggest that the NRC provide exposure-to-dose and intake-to-dose factors for an adult worker and a "representative member of the general public." The latter could be a composite of age and gender specific factors weighted by the proportion of that age/sex group in the U.S. population (2010 census).***

**Q1–4: Should the public dose limit of 0.5 mSv (50 mrem) continue to be the basis for the effluent concentration limits for the radionuclides in 10 CFR part 20, appendix B, Table 2, Columns 1 and 2? Should it be reduced or otherwise modified?**

***Comment:*** *It really is not important whether 0.5 mSv (50 mrem) or 1 mSv (100 mrem) is used for calculating these values. Because the staff is contemplating recalculating the effluent limits based upon the latest ICRP intake-to-dose conversion values (when they become available), it does not make much sense to revise Appendix B values based solely upon a dose change until that time. (Particularly as there would be no change necessary if NRC follows ICRP Publication 103).*

*The major nuclear facilities, such as power reactors, generally use dispersion/transport/dose models for determining compliance. These models are specified in the facility's Off-site Dose Calculation Manual and NRC Regulatory Guides. These major facilities might be affected by a reduction in dose limits (such as in an EPA revision[4] of 40 CFR Part 190). The principal licensees that rely on the effluent concentration limits are the smaller licensees, not the major nuclear facilities. There is no EPA or NRC rulemaking (other than for Part 20) presently scheduled that would lower the public dose limit for these smaller licensees.*

**Q2–1: Is closer alignment with or adoption of the ICRP Publication 118 (2012) recommendations regarding the dose limits to the lens of the eye appropriate given the scientific information now available?**

***Comment:*** *Yes. Current evidence suggests that the 15-rem (0.15 Sv) limit may not be sufficiently protective.*

**Q2–2: How should the impact of a radiation-induced cataract be viewed in comparison with other potential radiation effects?**

***Comment:*** *Radiation-induced cataracts are not life threatening, generally occur later in life and can be treated by conventional or laser surgery. Consequently, they are less serious effects than the cancers that comprise the most common radiation bioeffects. For this reason, cataracts should be treated and regulated as less significant consequences.*

**Q2–3: What mechanisms could be applied to keep the cumulative exposure to the lens of the eye below the threshold of 0.50 Gy (50 rad)?**

***Comment:*** *Eye-glasses or face shields incorporating gamma-ray absorbing materials would appear to be the most likely method of reducing eye doses.*

**Q2–4: What methods should be allowed for measurement or assessment of the dose to the lens of the eye?**

***Comment:*** *If protective eye glasses or face shields are used a TLD chip could be inserted into the front of the nose frame to record the unreduced dose.*

**Q2–5: What methods should be allowed for recording dose to the lens of the eye when the eyes are protected?**

[4] EPA ANPR 79 FR 6509 February 4, 2014.

***Comment:*** *A major difficulty with the TLD chip approach is that the protection factor of each pair (type or make) of eye glasses or shields would have to be determined in order to convert the external dose value to a dose that is closer to a shielded dose. Although this approach would require considerable effort, it is similar to that already used for respiratory protection devices.*

**Q2–6(a): What are the potential operational impacts of lowering the annual occupational dose to the lens of the eye from the current NRC regulatory standard of 150 mSv (15 rem) to 50 mSv (5 rem)?**

***Comment:*** *I can only think of a limited number of situations outside of medical radiation applications where the eye would be irradiated and the whole body would not also be irradiated. In most situations, protecting the whole body to meet a 50 mSv annual limit should also protect the eye.*

**Q2--6(b): Would a reduction in the occupational dose limit for the lens of the eye require changes in programs, procedures, practices (e.g., increased use of protective eyewear), or in-room shielding? If so, please describe these changes, including any potential implementation and operational costs.**

***Comment:*** *In medical exposure situations the use of radio-protective aprons and partial body shielding is an example of where the eye could be exposed to higher doses than the rest of the body and additional protection might be needed to meet a 50 mSv eye dose limit.*

**Q2–7: What are the potential impacts on State regulatory programs of a reduction in the occupational dose limit to the lens of the eye from the current NRC regulatory standard of 150 mSv (15 rem) to 50 mSv (5 rem)?**

***Comment:*** *This could have a major impact for interventional radiologists and fluoroscopists. Although the radiation exposure of these medical workers is from X-radiation sources not licensed by the NRC, in many cases they would fall under Agreement and non-Agreement State licensing authority and might be subject to the same dose limits as their other licensed sources such as those regulated under delegated Atomic Energy Act authority. .*

**Q3–1(a): Are there any significant anticipated impacts associated with reducing the dose limit to the embryo/ fetus of a declared pregnant woman, including operational impacts?**

***Comment:*** *Are there significant data (other than the ICRP recommendation) that the current limit is not sufficiently protective? I doubt that the NRC has bothered to collect data on actual exposures to pregnant women to support the need for a reduction in the limit.*

**Q3--1(b): What are the potential implementation and operational costs?**

**Q3–2: Are there any benefits or impacts associated with applying the reduced dose limit over the entire gestation period, or only to the period after declaration?**

***Comment:*** *A major difficulty with protection of the embryo/fetus is the fact that the most sensitive periods for radiation injury (pre-implantation and organogenesis) occur in the earlier stages of pregnancy before the pregnancy may be known by either the woman, her physician, or her employer. Consequently, applying the reduced dose limit only after declaration may not provide the optimum protection of the embryo/fetus.*

*Application of the reduced limit to the entire period of gestation creates the possibility of an "a priori" violation if the dose received prior to declaration exceeded the reduced dose limit.*
*In order to avoid this I suggest:*

> *1. The dose received by the woman prior to her declaration and after the estimated date of conception be required to be estimated and, if smaller than the reduced limit for the entire gestation period, be subtracted from the embryo-fetal dose limit to give a modified limit for the remainder of the her pregnancy.*
> *2. If the pre-declaration dose exceeded the embryo-fetal limit, it be treated as if there is no violation if the dose received after her declaration is kept below 10% of the embryo-fetal limit. This is the procedure currently prescribed in § 20.1208 (d).*

**Q3–3(a): Are there any anticipated implementation impacts on recordkeeping if the dose limit to the embryo/fetus is lowered to 1 mSv (100 mrem)?**

***Comment:*** *A problem could arise if the TLD replacement was on a quarterly rather than a monthly cycle. This would increase the uncertainty related to how much dose was received after the declaration of pregnancy.*

**Q3-3(b) What are the potential implementation and operational costs?**

**Q3–4: Are there technological implementation issues, such as limits of detection, which would make adoption of the ICRP Publication 103 (2007) recommendation difficult in certain circumstances?**

***Comment:*** *As noted in staff Issue Paper 3 (NRC-2009-0279-0070), the*rm*oluminescent dosimeters (TLD's) commonly used for personal monitoring typically have detection sensitivities around 0.1 mSv (10 mrem). Near and below that dose their reproducibility tends to decrease. A 1 mSv limit over the gestation period is equivalent to 0.11 mSv (11 mrem) per month. This clearly is close to the limit for reliable measurement.*

**Q3–5(a): Are there data on actual dose distributions to the embryo/fetus of a declared pregnant worker?**

**Q3--5(b): What are the trends for these data?**

**Q4–1: (a) What are the potential implications of adding specific ALARA planning and implementation requirements to the 10 CFR part 20 regulations?**

***Comment:*** *This would be in addition to the current requirement in § 20.1101 (b) to have a radiation protection program with procedures and sound engineering controls to keep radiation exposures ALARA. What bothers me about the proposed step is that it might be a precedent for a requirement for a licensee to be ALARA. Given the often subjective nature of what is ALARA, I think that this evolution is both unnecessary and troublesome (raising issues similar to the Karen Silkwood case). The NRC staff has not made a convincing argument in either Issue Paper 4 or the ANPR that the proposed ALARA planning requirement will solve the problem of having some workers repeatedly receiving doses near the limits.* ***I do not believe that further ALARA requirements are necessary beyond §20.1101(b).***

**Q4--1(b): What changes to licensee radiation protection programs could be anticipated?**

**Q4--1(c): What would be the potential implementation and operational costs?**

**Q4–2: What regulatory language should be used for an additional ALARA planning requirement and what is the rationale for this language?**

***Comment:*** *None. As stated above, I do not believe that an ALARA planning requirement is required.*

**Q4–3(a): How does each of the described methodologies for addressing when an individual occupational worker approaches his or her cumulative dose for the year work for different classes of licensed uses (e.g., a worker at a nuclear reactor power plant versus an industrial radiographer versus medical personnel)?**

**Q4--3(b): What are the benefits and impacts of the various approaches to ALARA planning on the various types of licenses?**

**Q4–4: Should licensees be allowed to establish different ACLs for different groups of occupational workers? If so, what should be the basis for the various groupings?**

**Q4–5: How do the different methodologies previously discussed impact the ability of licensees to best address radiation protection within their programs?**

**Q4–6: Other than the methodologies discussed in the preceding section, are there other ways to evaluate occupational lifetime cumulative exposures that should be considered?**

***Comment:*** *Although §10 CFR 20.2104(a)(2) still requires that an attempt be made to obtain cumulative dose records, the elimination of the 5(N-18) dose limit in the 1991 Part 20 rule makes this non-essential for adequate protection unless planned special exposures are undertaken. Other than conformance with ICRP and NCRP recommendations, what is the Commission's rationale for reverting back to an approach that relies upon cumulative rather than annual doses?*

***Related Comment: The ANPR does not mention the Commission's (or staff) views on retaining the concept of a "planned special exposure" that exists in the current 10 CFR Part 20 (§10 CFR 20.1206). Does the Commission believe the fact that this concept was eliminated by the ICRP around 1990 precludes the necessity for public comment on the continuation of this concept?***

**Q4–7(a): What are the potential impacts to licensees, contractors, and dosimetry vendors of amending 10 CFR 20.2104 to require a licensee to account for exposure from an occupational worker's concurrent employment with another licensee?**

***Comment:*** *This requirement would have to contain a procedure similar to the current 10 CFR 20.2104 (c)(1) in the event that this information cannot be obtained. The Commission should not penalize the licensee if the information cannot be obtained. As in §20.2104 (a)(2), only an attempt to obtain the information should be required.*

**Q4--7(b): Are there any dosimetry vendors that provide concurrent dose records?**

**Q4-7(c): Should the NRC consider provisions that would require individual occupational workers to provide their occupational dose information in addition to requiring such information from licensees?**

***Comment:*** *I would be interested in knowing under what legal authority and mechanism NRC would use to accomplish this. NRC issues licenses to (1) reactor operators (10 CFR Part 55), (2) nuclear medicine practitioners (10 CFR Part 35) and (3) radiographers (10 CFR Part 34). These licenses contain provisions requiring submission of information to the NRC. Otherwise, individual workers are not licensed [56 FR 23383, May 21, 1991]. Of course, NRC could require the licensee to obtain this information and the licensee could require it from the worker as a condition of employment, but this seems to be a convoluted method for limiting doses. Perhaps it should be left to the licensee to make a "good effort" to obtain this information from other employers as in § 20.2104 (a)(2).*

**Q4–8 (a): Should the Agreement States be allowed to use more restrictive or prescriptive requirements if the NRC decides to use a performance-based approach?**

**Q4–8 (b): What are the benefits and impacts of the various methodologies discussed in the preceding section on Agreement State regulatory programs and Agreement State licensees? If the NRC issues a proposed rule, this information will be important in establishing an appropriate Agreement State compatibility level for any proposed regulatory requirements.**

**Q5–1: Will promulgation of amendments to the 10 CFR part 20 regulations with dose limits and other measurements shown in dual units, with the SI units shown first, followed by the traditional units in parentheses, cause an undue burden or hardship upon any licensee or class of licensees? If so, please explain and provide examples, including any potential implementation or operational costs.**

***Comment:*** *10 CFR Part 20 has been dual dimensioned since 1991. Changing the order to having the SI units come first and the outdated "special units" second should not prove to be a major difficulty for most licensees. If it is, I would question the wisdom of allowing such persons to use radiation and/or radioactive materials in the first place.*

**Q5–2(a): Should 10 CFR 20.2101(a) be revised to allow licensees the option of providing records in SI units or in traditional units?**

***Comment:*** *Yes, if the NRC is not requiring exclusive use of the SI units, the licensees should be able to choose which system they will use, providing that they are not allowed to "mix" the systems.*

**Q5--2(b): Should licensees be allowed to provide reports in the units used in licensee records?**

***Comment:*** *Yes, this will help eliminate errors from conversion. It would appear that the NRC (or a contractor) could make any conversions needed to get the values into the same format for a NRC report. This could be a computerized batch process and is likely to be less subject to error than the licensee hand correcting individual values.*

**Q5--2(c): Should licensees be required to record and report in both sets of units? Please provide reasons why or why not.**

***Comment:*** *No. The conversion process could entail error and, if so, how would the NRC staff know which value was correct without contacting the licensee? Why require the licensee to do duplicative work just because the Commission wants to perpetuate an obsolete system of units?*

**Q5–3(a): Should the NRC amend the appendices for 10 CFR part 20 to show values in SI units only, in traditional units only, or in both sets of units?**

***Comment:*** *This* ***concern could be*** *eliminated, if the Commission would rethink its position in SRM–SECY–12–0064 regarding the retention of the older radiation units.*

**Q5--3(b); If both SI and traditional units are provided, which set of units should be considered as the regulatory standard?**

***Comment:*** *This concern could* ***be*** *eliminated, if the Commission would rethink its position in SRM–SECY–12–0064 regarding the retention of the older radiation units.*

**Q5--3(c): If only one set of units is specified, what would be the most effective means to provide the other set of units (e.g., in a separate guidance publication)? Please provide reasons why or why not.**

***Suggestion:*** *Move the effluent limit values (and sewer concentrations) from Part 20 and place them in a separate document which then could be incorporated into Part 20 by reference. DOE has done this for its Order 458.1. The effluent limits are in a separate DOE Technical Standard. DOE-STD-1196-2011, "Derived Concentration Technical Standard" (c.f. 79 FR 43290). This approach has the following advantages for Part 20:*

*1. It clearly separates the limits applicable to the general public from the ALI's and DAC's for the worker.*
*2. Changes should be able to be made by a simple notice and comment action without a formal rulemaking.*
*3. The DOE-STD-1196-2011 shows that values in both SI and the older "Special Units" can be incorporated on the same line which cannot be done in the present Appendix B format. Both systems of units could also be employed for occupational concentration limits (ALI's and DAC's) in a revised Appendix B.*

***Suggestion:*** *Retain the XE-Y format rather than going back to the* $X10^{-Y}$ *format as the superscripts are difficult to read in small type.*

***Additional Comment on SI Units***

*The 1986 proposed Part 20 rule (Federal Register of January 9, 1986, 51 FR 1092) would have permitted NRC licensees to use either the SI system or the "old" units for record keeping and reporting providing that they were consistent and did not mix the systems. The final rule (Federal Register of May 21, 1991, 56 FR 23360) required the sole use of the "older system." The reasons for this were: (1) concern that adoption of the new units would add to the complexity of implementing the extensive changes in Part 20 (see the Federal Register of May*

*21, 1991, 56 FR 23366) and (2) concern that this could have serious repercussions in the event of an emergency (as pointed out by Armin Ansari in Health Physics News, XL(3) p. 23 March 2012). Having different licensees on different systems would cause confusion in having the NRC or State determine which system a licensee was using and if personnel from a facility on one system were transferred to a second facility on the other system. (5 rem may be the legal occupational limit, but 5 Sv could be lethal).*

*All major radiation advisory organizations, all major radiation journals and most international organizations and foreign governments have adopted the SI units. The NRC even warned licensees that:*

> However, as the national move to metrification continues, as anticipated in section 5164 of the Omnibus Trade and Competiveness Act of 1988 [Pub. L. 100-418], at some later time there may be amendments to part 20 that would require the use of SI units only [becquerels, grays, and sieverts]. (Federal Register of May 21, 1991, 56 FR 23366)

***I believe that this time is now.***

*I can understand the NRC's position in SRM–SECY–12–0064, where the Commission disapproved the elimination of traditional units from the NRC's regulations. There are important reasons not to change:*

1. *The change would require hundreds of thousands, if not millions of dollars, for licensees to implement.*
2. *There would be no significant benefit to public health*[5].

*However, the principal U. S. regulations (NRC and DOE) have been dual-dimensioned for over 20 years and a whole generation has grown up being taught both the SI system and the "older" units. Thus there is no excuse for someone in the radiation protection field not being familiar with the SI units. I am dismayed that the NRC has decided that it and its licensees will continue to remain in the 20th century and not be consistent with most of the other countries that have adopted the SI units exclusively.* ***Most of the problems raised in questions 5-1 to 5-3 could be reduced, if not eliminated, if the Commission would rethink its position in SRM–SECY–12–0064 regarding the retention of the older radiation units.***

[5] There could be a benefit to instrument manufacturers in not having to make two versions of their survey meters with different scales. Having two different switchable sets of scales on the same instrument is asking for trouble.

**Q6–1: What criteria should the NRC use to identify additional categories of licensees that should be required to submit annual occupational exposure reports under 10 CFR 20.2206(a)?**

***Comment:*** *The current classes of licensees required to submit reports under 10 CFR 20.2206(a) appear to include those most likely to have workers with significant exposures. Additional categories might include uranium mills. The quantity limits in § 20.2206(a)(7) are low enough to include most nuclear pharmacy, nuclear medical and radiotherapy operations.*

**Q6–2: What are the benefits of collecting occupational exposure information in one central database to assess the total annual occupational exposure of those individuals who work at more than one licensed facility or contractor facility during the calendar year and receive occupational exposures at these facilities?**

***Comment:*** *The question contains the principal benefit of collecting this information.*

**Q6–3: Should Agreement States be required to adopt regulations that are compatible with the requirements in 10 CFR 20.2206?**

***Comment:*** *Many of the classes of licensees under 10 CFR 20.2206 are not subject to Agreement State regulation so what could be compatible? Other than providing more complete data on occupational exposure, there does not appear to be a major advantage in making this a condition of compatibility.*

**Q6–4(a): Should the NRC consider a gradual expansion of the 10 CFR 20.2206 licensee reporting categories in a step-wise fashion (e.g., staggered compliance dates for different categories of licensees)?**

***Comment:*** *Of what benefit would a staggered implementation be to licensees?*

**Q6--4(b): What are the advantages or disadvantages for this option?**

***Comment:*** *It might lessened the burden on the REIRS staff.*

**Q6–5: What are the potential implementation and operational costs associated with expanding the occupational exposure reporting requirements?**

## Additional Comment on the Relationship of 10 CFR Part 20 to Appendix I to 10 CFR Part 50 (and §§50.34a and 50.36a)

The Commission has noted that it might revise 10 CFR Part 50, Appendix I [79 FR 43289]. I suggest that, rather than conduct a rulemaking for this purpose, the Commission withdraw Appendix I and §50.34a and §50.36a to 10 CFR Part 50. The purpose of these sections is to specify what constitutes "as low as is reasonably achievable" (ALARA) for effluents from light-water-cooled nuclear power reactors. This was done in the 1970's under conditions that are no longer applicable and it is my personal belief that Appendix I is archaic and no longer needed for the following reasons:

1. Before Appendix I was issued, the (AEC) dose limit for members of the general public was 500 mrem/year. Drs. John Gofman and Arthur Tamplin were applying this number for populations around

nuclear power plants and, with the use of inflated risk estimates, were postulating thousands of potential deaths. The current dose limit in both 40 CFR Part 190 and 10 CFR Part 20 (by incorporation of 40 CFR Part 190 by reference in § 20.1301(d)) is one-twentieth of this (25 millirem) and only applies to the most exposed individual; the average dose to an individual in the 50-mile enclosed population is much less.

2. Because the "design objectives" of Appendix I are roughly comparable to the dose limits in EPA's 40 CFR Part 190 (for a two reactor site), there is no additional public health protection to be gained by retaining them; nor is there a need to define what is "ALARA."

3. EPA has issued an Advance Notice of Proposed Rulemaking indicating its intent to revise its Uranium Fuel Cycle Standards (40 CFR Part 190) [79 FR 6509 February 4, 2014]. **In my opinion, such a revision is unlikely to result in a dose limit higher than 25 mrem/year.** Although, for a two-unit reactor site, the 40 CFR Part 190 limits and Appendix I design objectives currently are roughly equivalent, a reduction in 40 CFR Part 190 would make Appendix I less so.

4. Appendix I specifies design objectives, not dose limits. This could be deceptive and might be misleading to the general public which could believe that they were absolute limits.

5. The dosimetry approach used to implement Appendix I is based on the obsolete "critical organ " concept, rather than "effective dose" and would have to be changed to be compatible with 10 CFR Part 20.

6. The so-called "limiting conditions of operation (LCO's)" in Appendix I are not LCO's in the more usual meaning of a LCO in 10 CFR Part 50 in that exceeding them does not require shutdown of the facility. [An example of a true limiting condition of operation would be: "The licensee must have at least two auxiliary feedwater pumps in operable condition." If there aren't any feedwater pumps in operable condition or only one, the plant cannot operate legally.]

7. The cost-benefit analysis (which was not a requirement in the AEC/NRC staff's version) has resulted in few additional radwaste treatment system modifications, primarily because, if you meet the design objectives that were set using $1,000/person-rem, there is little else you can add cost-effectively to reduce the dose.

8. The fact that this cost-benefit analysis pertains to the dose to the population within 50 miles is complicated by the fact that the population within 50 miles eats food grown outside that radius and some food grown inside of 50 miles is eaten by people outside of 50 miles. I had to make the assumptions in Appendix D of Regulatory Guide 1.109 that:

   a. If the population with 50 miles exceeds the population that could consume all of the estimated amount of food produced within 50 miles, then all of the food produced within 50 miles is consumed by the population within 50 miles.

   b. If the amount of food produced within 50 miles of the reactor site exceeds the amount of food that would be estimated to be consumed by the population within 50 miles, then, for the purpose of computing the collective (population) dose, only the amount of food estimated to be eaten by the 50-mile enclosed population is considered.

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Attached are comments on the NRC Advance Notice of Proposed Rulemaking on 10 CFR Part 20 published in the Federal Register of July 25, 2014 [79 FR 43284].

If there are any questions or if further information is needed please contact me at:

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