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OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

September 24, 2001

Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

ATTENTION: Rulemakings and Adjudication Staff

SUBJECT: NRC Proposed Rule on "Revision of the Skin Dose Limit," 66 Fed. Reg.
36502, dated July 12, 2001

This letter provides the comments of the Nuclear Energy Institute¹ on behalf of the nuclear energy industry regarding the subject *Federal Register* notice. These comments were developed from industry input with the assistance of a group of industry radiation protection staff that reviewed the proposed rule, accompanying information, and supporting regulatory analysis.

The proposed rule has a strong scientific basis, which we believe is requisite to assuring that workers will continue to be fully protected. The proposed rule reflects the recommendations and advice of the Congressionally-chartered National Council on Radiation Protection and Measurements (NCRP). The NCRP recommendations have been endorsed by the 85 scientific experts on the Council. The NRC has also incorporated advice from the NCRP in order to create a uniform approach to estimating dose to the skin that will help improve and simplify the application of the proposed rule.

In establishing the protective standard in the proposed rule, the NRC has relied on the results of scientific research conducted at the Brookhaven National Laboratory. This research was contracted by the NRC specifically to confirm that there would not be any significant health effects associated with the change to the skin dose limit contemplated in the proposed rule. An independent scientific research project at Texas A&M University, conducted under contract from the Electric Power Research Institute, yielded similar confirmatory results.

¹ NEI is the organization responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry, including regulatory aspects of generic operational and technical issues. NEI members include all utilities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry.

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The proposed rule incorporates a risk-based approach that will allow licensees to better evaluate workplace conditions and potential risks and select protective measures that optimize radiation protection and industrial safety. The flexibility in implementation provided by the proposed rule will help avoid the use of overly restrictive practices and equipment, thereby enhancing worker efficiency and lessening the time spent in radiological work areas. This will have the effect of reducing whole-body radiation dose and physiological stress to workers (e.g., heat stress) with little or no increase in risk associated with radiation dose to the skin. As a result, the proposed rule will support an overall improvement to worker safety.

The proposed rule will permit a reduction of unnecessary burden while maintaining the current level of protection of worker health and safety. The proposed change is uniform, simple to implement, and fits within the existing regulatory framework for radiation protection. The rule will enable licensees to reduce or eliminate intermittent surveys and monitoring checks presently performed in radiological areas to document compliance with the overly restrictive criteria in the current regulation. Such surveys and checks have resulted in additional whole body dose to workers and health physics staff with little or no benefit to worker health and safety—additional dose that will be avoided as a result of implementation of the proposed rule.

Under the proposed rule, licensees will continue to report to workers and the NRC occupational radiation dose, including dose to the skin, consistent with the current regulation. NRC staff guidance provides options to licensees for recording dose from discrete radioactive particles on annual dose reports from which the NRC is able to determine that an overexposure has not occurred. The proposed rule will change the method for estimating dose to the skin but it does not, and should not, change existing dose reporting requirements and guidance. We suggest that the final rule include accompanying information that confirms this point.

Under the proposed rule the current protective level of public health and safety will be maintained. The proposed rule is limited to making a change in regulation to establish a risk-based approach for estimating dose to the skin, which will have the affect of improving overall worker safety and reducing occupational radiation dose to workers. The proposed rule does not change regulatory requirements to monitor and control licensed radioactive material and to prevent any unauthorized release of radioactive material from restricted area of licensee facilities.

In summary, the proposed rule when adopted, will establish a risk-based approach to the regulation of occupational radiation dose to the skin that enables licensees to enhance worker safety and reduce unnecessary burden, while maintaining the current protective level of public health and safety.

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We appreciate the opportunity to provide our comments on the proposed rule. If you have any questions regarding our comments, please contact Ralph Andersen at (202) 739-8111.

Sincerely,



James W. Davis

Comments to Federal Register Notice Vol. 66 No. 134
Proposed Changes to 10CFR20 Regarding Averaging Shallow Dose
Equivalent due Discrete Radioactive Particle Exposure
William. T. Bullard, CHP

Foot note 1 on page 36506 of the Federal Register reads as follows:

For example, one recent event at a nuclear power plant involved a Co-60 DRP with an activity of about 75 mCi. The deep dose equivalent estimated from this particle (had it been on the skin) was calculated to be about 10 rem/h per mCi. For particles in this activity range, the deep dose equivalent (DDE) limit of 5 rem per year can be exceeded in less than 1 minute. The proposed skin dose limit could be exceeded in even less time.

The above statement points to the need to revise the 10CFR20 definition for deep dose equivalent in favor of one recognizing the concept of effective dose for external exposures. It is inappropriate to use the DDE limit applicable to uniform body irradiation to describe the risk from exposure to the 1 cm deep tissue below the particle on the skin. This concept appears to be recognized by footnote 2 in the 10CFR20.1003 definition of weighting factor which permits use of weighting factors on a case basis for other than whole-body irradiation until additional guidance is issued. It is time for additional guidance.

By definition only, the case described is deep dose equivalent but it is incorrect to describe it as equivalent dose and to apply limits aimed at preventing biological effects in exposed workers. To better describe the potential risk of the exposure, the concept of effective dose equivalent needs to be incorporated in evaluations of dose especially with regard to exposures arising from a DRP on the skin.

Using the work of Reese et. al, the maximum effective dose equivalent arising from irradiation by a particle on the skin for 1 MeV photons would be for the adult female case. Table 10 of Reese's work provides effective dose equivalent as a function of point source location on the torso for the adult male and adult female and indicates a maximum of $1.79 \text{ E-}13$ rem per photon.

The data suggests that for a 1 mCi source of 1 MeV photons the maximum effective dose equivalent rate would be approximately 25 mrem per hour. Translating this to Cobalt-60 (2 photons per transformation) yields about 50 mrem per hour not the 10 rem per hour described. Conversion for the 75 mCi Co-60 source described in the Federal Register, results in the maximum effective dose equivalent of no more than 4 rem/hr for the adult female and about half this for the adult male. The SDE limit of 50 rem averaged over 10 cm² is by far the limiting case and is still a small fraction of the point at which deterministic effects (observable skin changes e.g., small scabs that heal completely) would be expected (threshold ~ 6 krads).

Applying the DDE limit to tissue at 1 cm below the skin surface overstates the potential risk and may influence licensees to overestimate the record dose from DRPs. In turn, in an effort to avoid regulatory findings, licensees may impose inordinate field monitoring requirements that actually increases radiation exposure and attendant stochastic risk to technicians monitoring workers for the presence of DRPs and the workers themselves from work inefficiencies associated with performing the additional monitoring.

It is suggested that the discussion of deep dose equivalent arising from DRP exposure be eliminated from the rule making discussion concerning averaging shallow dose equivalent over 10cm² versus 1cm² and that new rulemaking recognizing the concept of effective dose equivalent is needed to avoid unnecessary real dose to workers attempting to avoid "paper doses" that have no significant biological endpoint or risk basis.