BOSTON EDISON Pilgrim Nuclear Power Station Rocky Hill Road Plymouth, Massachusetts 02360

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BECo 93-121

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10CFR20.2301: APPLICATION FOR EXEMPTION FROM APPENDIX B TO 10CFR20, TABLE 1, FOR Kr-89 AND Xe-137 DERIVED AIR CONCENTRATIONS FOR POSTING REQUIREMENTS UNDER 10CFR20.1902

Boston Edison Company (BECo) is preparing to implement the Final Rule on Standards for Protection Against Radiation, 10CFR2O, on January 1, 1994. Section 20.1902(d) of the Final Rule specifies posting requirements for airborne radioactivity areas (ARAs), and section 20.1003 defines an ARA based on the derived air concentrations (DACs) provided in Table 1 of Appendix B to 20.1001-20.2401.

For short half-life beta-gamma emitters not individually listed in Table 1, Appendix B provides a generic DAC of 10⁻⁷ uCi/ml. BECo is requesting exemption from the generic DAC for Kr-89 and Xe-137 in order to use more appropriate specific DACs for these radionuclides.

SPECIFIC EXEMPTION REQUEST

BECo requests exemption to use DACs of 10^{-6} uCi/ml for Kr-89 and 10^{-5} uCi/ml for Xe-137 instead of using the generic DAC of 10^{-7} uCi/ml for these nuclides when determining whether an area is, and requires posting as, an airborne radioactivity area.

BASIS FOR EXEMPTION REQUEST

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Boston Edison Company requests exemption to use specific DACs of 10^{-6} uCi/ml for Kr-89 and 10^{-5} uCi/ml for Xe-137. These specific DACs are needed because these two radionuclides are a significant fraction of the noble gas radioactivity in a BWR and the generic DAC provided in Appendix B to 20.1001-20.2401 for unlisted, short half-life beta emitters (10^{-7} uCi/ml) is too small for these nuclides. Using this generic DAC would cause overposting of airborne radioactivity areas which erodes the significance of the posting and consumes resources.

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The current regulation (20.1-20.601) lists the generic short half-life betagamma emitter occupational maximum permissible concentration (MPC) in air as 10^{-6} uCi/ml. This is appropriate for Kr-89 but inappropriately small for Xe-137. Since the revised regulations (20.1001-20.2401) provide a generic DAC (10^{-7} uCi/ml) which is one-tenth of the current generic MPC (10^{-6} uCi/ml) the overposting would be more significant under the revised regulations.

Reference (a) shows that Kr-89 and Xe-137 are the two most abundant noble gases in BWR steam (in units of radioactivity) and make up about 59% of the total noble gas activity. When reactor steam leaks into the air of a room with a ventilation half-time of about five minutes (such as the RCIC compartment at Pilgrim Station) these two nuclides make up about 41% of the noble gas radioactivity in the air at equilibrium. If the generic DAC (10^{-7} uCi/ml) is used for these two nuclides, airborne radioactivity area posting is required when the dose rates from the noble gas are very low, as shown below.

In accordance with 20.1001-20.2401 and Appendix B, DAC values are determined so that exposure to one DAC results in 5 Rem whole body dose or 50 Rem organ or tissue dose per working year, whichever is limiting. Reference (b) gives beta and gamma dose factors for exposure to an infinite hemispherical cloud of various noble gases. Using these factors, if a person were to be in this concentration for an entire working year, the skin and whole body doses resulting from exposure to 10^{-7} uCi/ml (the generic DAC) of Kr-89 or Xe-137 are as follows.

Nuclide	Skin Dose		Exposure Limit	Whole Body Dose		Exposure Limit
Kr-89	0.609	Rem/yr	50Rem/yr	0.379	Rem/yr	5Rem/yr
Xe-137	0.310	Rem/yr	50Rem/yr	0.032	Rem/yr	5Rem/yr

However, exposure to the requested DACs of 10^{-6} uCi/ml for Kr-89 and 10^{-5} uCi/ml for Xe-137 will result in the skin and whole body doses shown below.

Nuclide	Sk	in Dose	Exposure Limit	Whole	Body Dose	Exposure Limit
Kr-89	6.1	Rem/yr	50Rem/yr	3.8	Rem/yr	5Rem/yr
Xe-137	31.0	Rem/yr	50Rem/yr	3.2	Rem/yr	5Rem/yr

Since these doses are less than the limits of 50 Rem/year to the skin and 5 Rem/year to the whole body, and the eye dose is even less restrictive, the requested DACs are consistent with the DACs provided for other nuclides in Appendix B.

- (a) ANSI/ANS-18.1-1984, Radioactive Source Term For Normal Operation of Light Water Reactors
- (b) Regulatory Guide 1.109, Calculation of Annual Doses to Man From Routine Releases of Reactor Effluents for the Purposes of Evaluating Compliance With 10CFR50, Appendix I

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The specific exemption request is authorized by law, will not present undue risk to public health and safety, and is consistent with common defense and security. The requested exemption relates to compliance with the occupational exposure limits for plant personnel and does not present undue risk to the public health and safety.

Special circumstances are present where application of the regulation's generic derived air concentration is not necessary to achieve the underlying purpose of the rule because the exemption request ensures compliance with the occupational exposure limits for plant personnel.

Strict compliance with the generic DACs would result in undue hardship and overburden operational staff by posting areas that are normally not required to be posted to comply with the occupational exposure limits while providing little-to-no benefit. The exemption request does not decrease any safety measures employed at the plant and does not invalidate previous commitments or requirements to comply with regulations.

SCHEDULE FOR REQUESTED APPROVAL

BECo requests NRC approval by November, 1993, so that we may complete our Radiation Protection Program to comply with revised !OCFR20 requirements by January 1, 1994.

Boulette.

ETB/WGL/nas/10CFR20

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