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Comments on the Proposed National Hazardous Air Pollutant Emissions Standards for Radionuclides

[48 Fed. Reg. 15076 (April 6, 1983)]

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The Natural Resources Defense Council, a national organization of more than 40,000 members dedicated to protecting public health and the environment, submits these comments on the Environmental Protection Agency's proposed hazardous air pollutant emission standards for radionuclides.

In our opinion, what EPA has proposed does not meet the mandate of the Clean Air Act.

In these comments we address once again the issue of how EPA should be setting hazardous air pollutant standards. EPA, we believe, has adopted an approach to setting these standards which is in complete conflict with the health-protection requirements of the Clean Air Act. As a result, the standards EPA has proposed for source categories the Agency has decided to regulate, and the decisions EPA has made not to regulate certain other categories, fail to protect public health as the law requires.

Under a statute which requires EPA to protect public health with an ample margin of safety, NRDC cannot see any justification for proposed standards (as in the case of uranium mines and mill tailings) which leave persons exposed to incredibly high lifetime cancer risks -- as high as 1 chance in 500 of contracting a fatal cancer. Under this statute, NRDC cannot see any justification for proposed standards (as in the cases of almost all the categories of radionuclides sources) which allow sources to continue operating with mediocre emission controls -- technology far less effective than the controls already in use at the leading facilities.

NRDC cannot see the justification for refusing (as in the case of coal-fired boilers) to consider the total risk posed by radionuclides and the dozens of other known and suspected toxic trace contaminants present in the same particulate matter emissions. Neither can NRDC see the basis for considering only "average" risks from such plants, when there may be a substantial number of plants more dangerous then average which should be subject to controls.

Part I of these comments addresses the test for delisting a hazardous air pollutant. Part II addresses the flaws in the Agency's approch to setting hazardous air pollutants and the approach which NRDC has recommended instead. Parts III, IV, and V, address the specific proposals and decisions not to propose for Department of Energy facilities, the phosphate industry, and coal-fired boilers. Regarding the proposed standards for uranium mining, milling, and mill tailings, NRDC endorses the comments of the Environmental Defense Fund.

I. The Burden Of Proving That Radionuclides Are Not A Hazardous Air Pollutant

We understand that the American Mining Congress has argued, in the public hearings, that radionuclides should be removed from the list of hazardous air pollutants. NRDC strongly disagrees, for the following reasons.

Section 112 of the Clean Air Act defines hazardous air pollutants as substances that "cause, or contribute to, air pollution which may reasonably be anticipated to result in an

increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness." Based on the evidence that radionuclides cause various forms of cancer and genetic damage, EPA correctly concluded that radionuclides are hazardous air pollutants and so listed them in June 1977. In response to testimony and comments EPA will receive arguing that radionuclides should not be listed as a hazardous air pollutant, let us review the legal test that industry must meet.

First, it is essential to recognize that Congress has established a highly precautionary, qualitative test for hazardous air pollutants, in order to insure the public a very high degree of protection from known and suspected causes of cancer and other very serious diseases. We therefore agree with the position articulated in the Agency's 1979 airborne carcinogen policy that there is no quantitative test for the listing of substances as hazardous air pollutants. Moreover, the statute imposes a very high burden on those who wish to have a substance removed from the hazardous air pollutants list at this stage. Section 112(b)(1)(B) states that the Administrator may not remove a substance from the hazardous air pollutants list "unless he finds, on the basis of information presented at such hearings, that such pollutant clearly is not a hazardous air pollutant." This places the burden on industry to present evidence that overwhelmingly rebuts the evidence on which EPA has concluded radionuclides are a hazardous air pollutant. Mere quantitative assertions that the risks are not high, presentations of limited, purportedly negative epidemiological studies, or assertions that risks are "acceptable" will not suffice to meet this test.

II. Setting Hazardous Air Pollutant Standards

Section 112 of the Clean Air Act requires EPA to set standards that will protect the public health with an ample margin of safety. NRDC agrees with EPA's conclusion that for pollutants such as radionuclides, there is no means of identifying threshold doses, and in fact there may be no thresholds. We do not agree with EPA's enormous leap to the conclusion that the absence of identifiable thresholds permits the Agency to make costs the dominant factor and to drop down to standards that require no more than mediocre pollution controls.

NRDC's analysis of the statute and legislative history of Section 112 have been made available to the Agency in our recent comments (with EDF) on EPA's draft policy paper on toxic air pollutants.1/ These comments are attached as Appendix A and Appendix B.

To recap briefly, NRDC does not believe Section 112 of the Clean Air Act gives EPA any authority to perform cost-benefit analyses in order to set hazardous pollutant standards. That, however, is exactly what EPA has done in these proposals.

The Agency previously has asserted the following test for hazardous air pollutant standards. First, EPA defines the "Best Available Technology" (BAT), defined as "the most advanced level

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1/ "Comments of the Natural Resources Defense Council and the Environmental Defense Fund on the OAQPS Draft Toxic Air Pollutant Strategy (October 7, 1982) and the OPRM Comments (November 15, 1982)," December 16, 1982 and "Comments of the Environmental Defense Fund and the Natural Resources Defense Council on the Environmental Protection Agency's Proposed Process for Evaluation and Control of Toxic Air Pollutants," June 10, 1983.

of controls adequately demonstrated considering economic, energy, and environmental impacts." This definition has been grafted onto Section 112 from Section 111, the provisions of the Act governing New Source Performance Standards and pollutants which are, on a relative quantity basis, less dangerous than hazardous air pollutants. Second, EPA says it examines the residual risk, after application of BAT. If that risk is judged to be "unreasonable," further control is to be required.

The first step, "Best Available Technology," (BAT), is a misleading euphemism. With few exceptions, there is nothing "best" about the technology EPA proposes to require for these sources. As the Agency acknowledges, it takes costs heavily into account in determining what control technology to label "best." Historically, the use of this test -- exactly the same as that used for setting New Source Performance Standards under Section 111 of the Act -- has led EPA to establish standards based on a reference technology that is often not the state-of-the-art, at a level reflecting the past performance of the worst-performing sources within each category. These lowest common denominator standards do not meet any rational test of "best."

In the second step, analysis of "unreasonable residual risk," EPA essentially repeats the cost-benefit comparison made in the selection of BAT. In this rulemaking, EPA simply dropped the second procedural step, the examination of whether there is "unreasonable residual risk." The loss of this second step is of minimal practical importance, because in practice the second step has never been more than a sham. Having already performed the

cost-benefit analysis in selecting BAT, EPA not surprisingly tends to come to no different result after a look at the "reasonableness" of the residual risk.

The "BAT/unreasonable residual risk" amalgam does not satisfy the mandate of the Clean Air Act.

To the extent that EPA chooses to convert Section 112 standard-setting into a technology-based process, NRDC contends that the Agency has no justification for requiring control measures less effective than those already in use. That must be the minimum level of control even considered.

Often even the best controls already in use will be inadequate to protect the public adequately. In those cases, standards will have to be genuinely technology-forcing, requiring genuine advances in emission control designs and operation.

In our comments on the recent EPA policy paper, NRDC and EDF have suggested the following approach to setting hazardous pollutant standards. First, all sources of significant amounts of radionuclide emissions should be subject to standards.

Second, these standards, at a minimum, should reflect the lowest emission rate achievable by use of the most effective control technologies that one or more sources in the same category are already using or that are demonstrated and readily available even if not already in use. This test is analagous to the "lowest achievable emission rate" (LAER) as defined in Section 171(3) of the Clean Air Act.2/

2/ At least one reader of our prior comments has misunderstood this suggestion to mean that we favor a source-by-source (footnote continued)

Third, if the emissions remaining after application of the LAER-type standards are predicted to add to the lifetime risk of cancer or other fatal or very serious diseases of the most exposed individuals by an amount greater than one in a million, then genuinely technology-forcing controls should be required, as necessary to reduce the additional risks to that level or below.

Where LAER-type controls reduce the additional risk below the level of one in a million, such controls should still be used. They are the minimum which can be squared with the statutory mandate.

When more than LAER-type controls are needed to get risks down to this level, then as a provisional, priority-setting matter, we can accept an Agency policy of technology-forcing which stops at the point where the residual emissions are predicted to create an additional risk level of one in a million. At that point, EPA should move on to the next unregulated hazardous pollutant. In the future, it may be possible to further reduce the risk, but if EPA were working seriously on the backlog of unregulated hazardous pollutants, then for the present the protection of public health would be better served by moving on to the next substance at that point.

Unlike EPA's "unreasonable residual risk" test -- which as noted above has not even been applied in this rulemaking -- this

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determination of emission limits, in lieu of national emission standards. This is not what we mean. Rather, the concept of LAER -- use of the best technology already in use -- should be applied by EPA in determining the minimum level for the standard. We do believe that each source, both new and existing, should be subject to a permit assuring compliance with the standard.

approach to regulation of the risk remaining after application of a LAER-type standard justifies the "stopping point" not on cost-benefit grounds incompatible with Section 112 of the Clean Air Act. Rather, the "stopping point" we suggest is rooted in a priority setting judgment.

As we have indicated previously, EPA has some authority to make rational subcategorizations within source categories for the purpose of applying the LAER-type test. Such subcategories, however, will be carefully scrutinized to make sure that unsupportable distinctions are not made between sources to water down the force of the LAER-type test.

Also as we have previously discussed, EPA may have some limited authority to define "de minimis" emission levels and to conclude that sources emitting at rates below these levels need not be subject to standards. The limits on such authority and the Agency's heavy burden to justify exercises of it are discussed in Alabama Power Co. v. Costle, 636 F.2d 323, 357-61 (D.C. Cir. 1979). Such levels, however, would have to be judged against the de minimis levels already established for the existing hazardous air pollutants. See, e.g., 40 C.F.R. §51.24(b)(23)(i). Levels higher than these would be unacceptable and subject to judicial challenge.

This test for standard setting would preserve the main thrust of Section 112 -- a focus on health risks. Unlike EPA's "BAT/unreasonable residual risk" amalgam, this test does not allow cost-benefit analysis to compromise health protection from hazardous air pollutants. It sets a floor on the options for

standards -- the best controls already in use. When that is not enough to reduce risks below a one in a million additional chance of death or serious illness for the most exposed people, this test provides for further protection. In this instance, it requires genuinely technology-forcing standards -- at least as appropriate when dealing with carcinogens and other life-threatening pollutants as it is in the SIP process, where technology-forcing is clearly permissible.[3/] This test recognizes -- as Congress recognized -- that there will be situations when technology options may fail to protect adequately and the appropriate response is to close a plant.

The proposed rules do not approach compliance with the statute. The technology required is generally well below that already in use by industry leaders or reasonably available. Cost-benefit considerations have been allowed to dominate where precluded by law. In several instances, the Agency has proposed to allow facilities to continue creating incredibly high risks.

The comments which follow on specific radionuclide-emitting source categories measure EPA's proposals against this test.

3/ See Union Electric Co. v. EPA, 427 U.S. 246 (1976).

III. Department Of Energy Facilities

The first group of facilities covered by the proposed rule is the group of 25 Department of Energy (DOE) owned, contractor-operated facilities involved in research and development, production and testing of nuclear weapons, enrichment and production of nuclear weapons material, and management of radioactive wastes. EPA proposed a uniform, indirect emission standard for these facilities, restricting emissions to the amount that would cause a dose equivalent rate of 10 millirem per year (mrem/y) to the whole body and 30 mrem/y to any organ of any member of the public. EPA also proposed a requirement that each DOE facility submit an annual report to EPA including the results of monitored emissions and dose calculations for each site, and a description of the DOE program for maintaining airborne radionuclide releases as low as practicable below the standard.

EPA apparently developed those proposed requirements in the following manner. The agency first estimated the current dose rate and maximum lifetime risk to nearby individuals and populations at each of the 25 facilities. It concluded that at 15 of the facilities, the health impacts were relatively small, with doses considerably less than 1 mrem/y, and the estimated lifetime risk to the most exposed individual less than 10 in 1,000,000. At the remaining 13 facilities, EPA examined the cost of available additional emission control technology for each facility, and proposed a standard that can be met by almost all the facilities without any technological improvements. This standard, 10 mrem/y whole body and 30 mrem/y any organ dose

equivalent, is approximately twice as high as the corresponding NRC standard, in 10 C.F.R. Part 50, Appendix I, for radioactive airborne emissions from commercial nuclear power plants.

EPA attempted to defend its proposed standard by claiming that a lower uniform standard would prove extremely costly or could force the closure of major operations at facilities providing substantial benefits in the areas of electric power generation and national defense. The Agency claimed that the alternative of establishing direct emission limits for specific groups of facilities, as is done for non-radiological emissions, would be "more complex." EPA also abandoned the possibility of selecting a cumulative population standard or a risk equivalent, whole-body dose, claiming that such standards would not be useful or attainable. Finally, EPA claimed that since the proposed standard is lower than the 500 mrem/y upper limit recommended in 1960 by the Federal Radiation Council, it meets the Clean Air Act requirement of protecting the public health with an adequate margin of safety. As discussed below, the Natural Resources Defense Council (NRDC) disagrees with each of these claims, and believes the proposed standard is grossly inadequate under the Clean Air Act.

A. The Proposed Dose Standard Is Based Upon Incorrect Methodology and Assumptions

As a preliminary matter, EPA used several incorrect methodologies and assumptions in estimating current doses to individuals and populations at DOE facilities, and several of those errors are carried over into EPA's requirements for

measuring compliance with the proposed standard. First, the dose to the maximally exposed individual should be calculated at the site boundary in all cases, regardless of whether DOE asserts "good reasons why people are not likely to be at that location," as EPA now contemplates. 47 Fed. Reg. 15076, 15081. In regulating radiological emissions from commercial nuclear power plants and other licensed facilities, the Nuclear Regulatory Commission (NRC) establishes concentration limits on routine emissions to any "unrestricted area," which is defined as

> any area access to which is not controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials, and any area used for residential quarters.

10 C.F.R. §§20.3(a)(17); 20.106. The concentration limits apply at the boundary of the restricted area, regardless of whether the licensee can demonstrate that no individuals would ever be located at such boundary. EPA also proposes to apply the "unrestricted area" concept in regulating radioactive emissions from uranium mines, and limits radon concentrations in any area not under the control of the mine owner or a governmental agency. 48 Fed. Reg. 15076, 15083-84, 15089.

These provisions make eminent sense, since areas outside the control of a reactor licensee should be protected from excessive levels of radiation whether or not individuals are currently lcoated there. Allowing a licensee to exceed these limits upon a showing that no individual is "likely" to be located in a certain area is contrary to prudent health practice, and will only serve to ensure that the area will become uninhabitable. The only

justification for regulating the dose to an individual at the likely location rather than at the site boundary is in order to impose a more stringent dose limitation to the individual, as the NRC has done in 10 C.F.R. Part 50, Appendix I §IIB. EPA's proposed alternative would only increase the complexity of the proposed standard, with an accompanying decrease in the standard's long-range public health benefits.

The second incorrect assumption in the proposed standard is its integration of the whole body or organ dose to an individual over an estimated lifetime of 70 years. 48 Fed. Reg. 15076, 15077. This calculation is based upon an average life expectancy of 70 years, whereas the standard is supposed to protect the maximally exposed individual. The dose calculation should therefore be based upon the assumption that the maximally exposed individual is exposed in infancy and lives for at least 80 years, an assumption more consonant with today's increased life expectancy. See Intervenors' Brief in Support of Their Exceptions to the Atomic Safety and Licensing Board's Partial Initial Decision (Limited Work Authorization) of February 28, 1983, United States Department of Energy, Project Management Corporation, Tennessee Valley Authority (Clinch River Reactor Plant) 30, Docket No. 50-537 (May 18, 1983).

EPA also has erred in defining the term "dose to an individual" in terms of a dose rate to the whole body or a specified body organ. 48 Fed. Reg. 15076, 15077. This makes no more sense than measuring length in terms of units for speed. EPA appears to have corrected this error in the wording of the

proposed regulations, but the Agency should also correct the supplementary information accompanying the final rule.

Third, EPA's conclusion that setting emission limits to control doses to the general population from long-half-life radionuclides "would not serve a useful purpose" (48 Fed. Reg. 15076, 15081) is based on several incorrect assumptions and methodologies. First, EPA concluded that the population doses from these radionuclides are small based upon an estimate of the summed dose received by all persons in a population living within 80 kilometers of the source, due to a one year release of radionuclides. 48 Fed. Reg. 15076, 15077, 15081. Limiting the area of interest to a radius of 80 kilometers around a site, however, is extremely misleading in the case of certain long-lived radionuclides released as gaseous effluents, namely tritium, carbon-14, krypton-85, and iodine-129, which become distributed throughout the global atmosphere. See, e.g., Pacific Northwest Laboratory, U.S. Department of Energy, Control Technology for Radioactive Emissions to the Atmosphere at U.S. Department of Energy Facilities 4.3 (PNL-4621 Draft) (March 1983); U.S. Environmental Protection Agency, Estimates of Ionizing Radiation Doses in the United States 1960-2000 41 (ORP/CSD 72-1) (August 1972). Similarly, limiting the population dose estimate to a 70 year dose commitment severely underestimates the dose contribution of very long-lived radionuclides such as carbon-14 and iodine-129, which continue to endanger public health for thousands of years after release. See, e.g., U.S. Environmental Protection Agency, Health Impact

Assessment of Carbon-14 Emissions from Normal Operations of Uranium Fuel Cycle Facilities 22 (EPA 520/5-80-004) (March 1981).

In developing these regulations, EPA has in fact calculated the worldwide health consequences of emissions of carbon-14, iodine-129 and krypton-85 from all Department of Energy sites. U.S. Environmental Protection Agency, Background Information Document: Proposed Standards for Radionuclides 2.27-1 (EPA 520/1-83-001 Draft) (March 1983). The agency estimated that, over the entire residence time of these radionuclides, 10 fatal cancers would result from iodine-129 emissions, 5 fatal cancers from carbon-14, and 0.7 fatal cancers from krypton-85. Id. Given these results, it is difficult to credit EPA's assertion that the population doses from these radionuclides are small. In the preamble to the proposed regulations, EPA stated that the cumulative population dose and risk should be considered carefully, particularly if an extremely large population may be exposed. 48 Fed. Reg. 15076, 15079. Since the estimated population exposed to these long-lived radionuclides rightly includes the global population and future generations, and since the resulting doses and risks are so large, prudent health practice dictates that EPA promulgate a cumulative population dose standard as well as an individual dose standard.

Finally, EPA requested comment on the alternative approach of proposing the standard in the form of a risk-equivalent, whole body dose, using methodology similar to that recently recommended by the International Commission on Radiation Protection (ICRP). 48 Fed. Reg. 15076, 15081. NRDC could support such an approach,

provided an appropriate whole body risk equivalent standard is selected -- namely a whole body risk equivalent dose limit that would maintain a comparable degree of protection with the organ dose limits established under NRC's 10 C.F.R. Part 50 Appendix I.

EPA is incorrect in stating that this alternative approach would reduce the whole body standard to about 5 mrem/y to maintain a comparable degree of protection with the 30 mrem/y limit to any organ. 48 Fed. Reg. 15076, 15081. As shown below, EPA has developed a set of weighting factors which describe the proportion of the total risk from whole-body exposure which is assumed to arise from each of the various organs.

Assumed Risks of Fatal Cancer for Individual Organs Relative to Cancer Risk for the Whole-Body

Organ	Relative Risk
Breast	0.20
Lung	0.16
Red Bone Marrow*	0.16
Thyroid	0.04
Bone Surfaces	0.03
Skin	0.01
Other Organs**	0.08

* Assumes leukemia only

** Applies to each of the five other organs with highest dose.

U.S. Environmental Protection Agency, Background Report: Proposed Federal Radiation Protection Guidance for Occupational Exposure 70-71 (EPA 520/4-81-003) (Jan. 16, 1981). Applying EPA's proposed weighting factors, which are very similar to those proposed in ICRP Report No. 26, (id. at 70), the risk-equivalent whole-body dose would have to be close to 1 mrem/y, rather than 5 mrem/y, in order to maintain a comparable degree of protection with the 30 mrem/y limit to any organ, and close to 0.5 mrem/y in order to maintain a comparable degree of protection with the 15 mrem/y organ limit for thyroid and particulates under 10 C.F.R. Part 50, App. I, §II.C.

NRDC strongly opposes the use of a single 5 mrem/y whole-body risk-equivalent limit, which would severely weaken even the currently proposed EPA limit. As shown by the EPA weighting factors displayed above, a single 5 mrem/y whole body dose standard would permit corresponding organ doses up to 125 mrem/y for the thyroid and 167 mrem/y for bone surfaces. Doses to these two organs, which are critical organs of interest for the radionuclides emitted by these DOE facilities, are simply far too high adequately to protect the public health. Establishing such limits, when EPA readily admits that 30 mrem/y organ dose limits are achievable, is inconsistent with the fundamental health physics tenet of keeping doses "as low as reasonably achievable" (ALARA).

B. EPA Should Also Apply Selected Emission Standards

A strong argument can be made that the Clean Air Act requires EPA to control hazardous air pollutants through numerical emission standards or design, equipment, work-practice, or operational standards, and is not satisfied by indirect dose equivalent standards. In Adamo Wrecking Co. v. United States, 434 U.S. 275 (1978), the Supreme Court held that under Section 112 as written prior to 1977, an emission standard was intended to be a quantitative limit on emissions, not a work-practice standard. Although the Clean Air Act was amended in 1977 to permit regulation through either emission limits or design, equipment, work-practice, or operational standards, 42 U.S.C. §7412(e)(1), the logic of the Adamo case could be applied to

prohibit regulation of hazardous air emissions through an indirect dose standard, which is neither an emissions standard nor a work-practice standard.

Consequently, NRDC supports EPA's proposed use of indirect dose equivalent standards for DOE facilities only if they are accompanied by emission standards (expressed in terms of curies per relevant unit of production) based upon the use of best available technology. EPA rejected the alternative of setting different emission limits for new and existing DOE facilities and for specific groups of DOE facilities, on the grounds that the standard would be much more complex, and that the proposed standard, with its ALARA and reporting requirements, would provide the same measure of emission control. 48 Fed. Reg. 15076, 15081. Neither of these arguments is sufficient and the latter is simply incorrect.

First, as the Federal Radiation Council's Radiation Protection Guidance points out, it is perfectly acceptable to establish different Radiation Protection Guides with different numerical values, depending on the circumstances. 48 Fed. Reg. 15076, 15078. Setting different emission limits for different categories and subcategories of facilities is a well-accepted practice followed by EPA on numerous occasions. Furthermore, unlike the category of NRC-licensed and non-DOE federal facilities, which encompasses tens of thousands of facilities, the category of DOE facilities only includes 25 facilities, over half of which have emissions too small to even consider in the proposed rule. There is no reason why EPA could not group the

remaining 13 facilities into different categories, such as reprocessing operations, and set emission limits for key radionuclides from the most important categories. NRDC suggests the following key emission limitations:

1. control of emissions of tritium, krypton-85, iodine-129, and iodine-131 from the reprocessing and tritium handling facilities at the Savannah River Plant, the Hanford PUREX Plant, and the Idaho National Engineering Laboratory reprocessing plant (the Idaho Chemical Processing Plant);

2. control of plutonium emissions from the Rocky Flats plant;

3. control of uranium-235 and uranium-238 emissions from the Y-12 weapons facility on the Oak Ridge Reservation; and

4. control of uranium emissions from the Feed Materials Production Center in Fernald, Ohio.4/

Setting these emission limitations would be consistent with the requirements of the Clean Air Act, would affect only a limited number of facilities, and would reduce the doses from the most harmful radionuclides by a very large percentage.

This approach is not unusual; in fact, EPA took a nearly identical approach in regulating radioactive emissions from uranium fuel cycle facilities in 40 C.F.R. Part 190. Those standards limit the annual organ dose equivalent to nearby individuals, and limit as well the emissions of krypton-85, iodine-129, and other long-half-life, alpha-emitting

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4/ Since there are few DOE facilities covered by the proposed rule, several of the categories may include only one facility. NRDC supports further grouping of facilities if possible, and, as noted above, does not support a source-by-source determination of emission limits for other categories or subcategories containing multiple sources.

transuranics. Although the emission limitations are written in terms of a single emission limitation for the entire uranium fuel cycle, per gigawatt-year of electrical energy produced (40 C.F.R. § 190.10), as a practical matter, the limit applies almost entirely to the reprocessing facility, which emits most of the noble gases and transuranics covered by the emission limitation.

EPA's claim that the proposed standard, along with the ALARA and reporting requirements, would provide the same level of control as a emission standard, is without merit. The proposed standard makes no attempt to define what level of emission controls would be considered the best available technology for any facility or group of facilities, the regulations themselves fail to require the use of best available technology, and EPA has not committed to take any action on the basis of the annual reports it intends to require. The proposed standards prescribe no specific requirements which can be enforced. A firm emission limitation, based upon application of the best available technology, would provide far better control than a weak dose equivalent standard and toothless reporting requirements.

C. EPA Should Base the Emissions Standard Upon Application of the Best Available Technology

As explained above, the first step in regulating hazardous air pollutants should be to require the lowest emission rate achievable by application of the most effective control technologies that are in use or are readily available. The second step should be promulgation of genuinely technology-forcing emission controls (with or without dose equivalent

limits) to reduce the residual risk to a sufficiently low level.5/ The EPA proposed dose limit for DOE facilities, however, was set almost exclusively on the basis of economic considerations, and, as a result, is far too high. The fact that the standard is below the 500 mrem/y upper limit set in 1960 by the Federal Radiation Council does not by any means establish that it is adequate to protect the public health and safety. On the contrary, the NRC dose limits for radioactive air emissions from commercial nuclear power plants in 10 C.F.R. Part 50, Appendix I, which are approximately twice as stringent as the proposed EPA standard, provide a much better estimation of what dose limits are necessary and achievable using best available technology. At a minimum, the EPA standards should be set at a comparable level.

One of the background documents prepared for EPA's use in developing this regulation indicates that the application of best available technology at DOE facilities would achieve considerable reduction in radiological releases. Pacific Northwest Laboratory, U.S. Department of Energy, Control Technology for Radioactive Emissions to the Atmosphere at U.S Department of Energy Facilities (PNL-4621 DRAFT) (March 1983). Although this document was prepared for EPA by the Department of Energy, the regulated agency, and contains some significant omissions,6/ it

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5/ Although EPA cites the 1960 Radiation Protection Guidance as generally requiring a cost/benefit approach to radiation protection standard setting, this approach is inconsistent with the more stringent Clean Air Act regulatory framework, and is therefore not controlling. See 48 Fed. Reg. 15076, 15078. See also Section II of these comments, supra.
(footnote continued)

also presents, for each of the DOE facilities, a description of the cost and benefits of potential additional emission control technology.

The Savannah River Plant (SRP) is one example where application of additional currently available technology would significantly reduce emissions. The largest quantities of SRP radionuclides are released from the fuel reprocessing areas (F and H areas), followed by the three production reactor stacks (C, K, and P). Draft PNL-4621 at 19.4. DOE estimates that it could reduce the tritium emissions at the SRP production reactors by about 90% once steady-state operation is achieved after about 6 years, utilizing either vapor phase catalytic exchange with cryogenic distillation (CE-CD) or a thermal cycle absorption process. Draft PNL-4621 at 19.14. Capital costs for a CE-CD system are estimated by SRP staff to be in the $20-40 million range. Id. Estimated annual operating cost would be in the $1.5 to 2 million range, with an estimated operating life of 30 years. Id.

6/ The draft version of PNL-4621 completely omits any information concerning the radioactive releases and potential and existing emission control technology at the Feed Materials Production Center in Fernald, Ohio, since preparation of this section was begun "too late" for inclusion in the document. Id. at 7.1. As a result, NRDC was unable to evaluate the implications of the proposed dose standard on this facility, which has by far the highest projected dose rates of any DOE facility. 48 Fed. Reg. 15076, 15080. We certainly hope the section will be included in the final PNL-4621 document, and hereby reserve the right to submit additional comments on the proposed regulation in light of the additional material presented on the FMPC.

Similarly, DOE estimates that several techniques could be installed to remove carbon-14, the noble gases, and iodine, which contribute nearly all of the radiation dose from the separations plants, (id. at 19.15) and which, as noted above, are extremely long-lived radionuclides with global distribution. These techniques, including cryogenic distillation, fluorocarbon absorption, and absorption on mordenite beds, all have decontamination factors of about 100. Id. at 19.18. The SRP staff estimates that an integrated off-gas treatment system utilizing the above techniques, plus a C-14 absorber system, would cost about $50 million per plant, and would have annual operating costs of about $3 million. Id.

These examples illustrate the potential for emission reduction at DOE facilities using currently available technology. There is simply no excuse for EPA's failure explicitly to require application of these techniques, to calculate emission limitations based on the use of these and similar technologies, and to determine whether an additional dose or emission standard is required to reduce the residual risk to a sufficiently low level.

IV. The Phosphate Industry

NRDC believes several aspects of EPA's proposed standards for elemental phosphorus plants are highly questionable. While NRDC agrees that a standard is necessary for elemental phoshporus plants, we do not agree that the proposed standard is adequate.

First, the proposed standard for calciners is expressed in the form of one curie allowed per year (1 Ci/y). This standard will require only the two largest of the eight plants to install any additional control equipment. The Agency states that an alternative of establishing a standard based on curies per metric ton of phosphate rock produced was considered, but rejected. The only explanation given was that "this type of standard may require emission control retrofit by one or more additional plants even though their emissions of polonium-210 would be significantly less than 1 Ci/y." 48 Fed. Reg. 15085.

Nowhere does the Agency explain why it is sufficient to limit the emissions of these plants below 1 Ci/y when available technology permits greater reductions. Nowhere does EPA explain why the standard should apply only to large plants and not to smaller ones, when the only apparent significant difference among these plants is their size. We believe EPA must set a standard on a curies per metric ton of phosphate rock production basis.

Second, EPA has not adequately justified its determination that high energy venturi scrubbers, rather than fabric filters, are the most effective available technology. While EPA states that fabric filters are not yet in use on calciners, the evidence supports the conclusion that they are readily available for such

use. The Background Information Document (at p. 6.1-8) recites claims of difficulty made by industry sources:

> Many industry members believe that moisture condensation would be a major problem because water droplets could mix with the clay-like dust mat formed on the fabric media and cause a mud cake. Were this condition to occur, it would "blind" the bags. Furthermore, since the dust usually has no economic value, dry recovery for reprocessing is not an attractive incentive to operators. High exhaust gas temperatures associated with calciners are also commonly cited as a major difficulty expected with this type of control device.

Against these concerns, however, the Background Information Document reports the following response (at same page):

> However, manufacturers of these devices believe fabric filters can be effective for this application. They state that successful operation of fabric filters are common in more difficult operations, such as asphalt plants, cement plants, fertilizer dryers, and the clay industry. Under proper operating conditions, fabric filters generally exceed 99 percent efficiency.

Like the manufacturers of fabric filters, EPA also has substantial knowledge about successful uses of these controls in conditions at least as difficult and more difficult than those posed by calciners. EPA cannot simply dismiss this information by preferring the unsupported claims of the phosphate industry members. This is especially so under Section 112, where the use of all available technologies, including the application of controls used successfully in similar conditions in other industries, is a bare minimum requirement.

Third, the standard does not require the installation of control equipment on emission sources within these plants other than calciners. The use of fabric filters is unquestionably

feasible for such operations. The Background Information Document states (at p. 6.3-2):

> Emissions from nodule coolers and transfer points and furnace tap holes are controlled by either fabric filters or wet scrubbers. Screening plant emissions are usually controlled by fabric filters. . . .

For the operations other than calciners, fabric filters appear already to be in fairly widespread use. The proposed standard requires emission tests of such equipment, but does not require use of filters. NRDC believes use of filters should be required on these operations.

NRDC does not believe EPA has adequately justified its decision not to propose standards for other source categories within the phosphate industry. According to the Agency's listing decision of December 27, 1979, the maximally exposed persons in the vicinity of these facilities are exposed to very high risks (44 Fed. Reg. at 76743):

Source Category	Lifetime Cancer Risk to Most Exposed
Mining and beneficiation	3 in 10,000
Drying and grinding facilities	5 in 10,000
Phosphoric acid plants	2 in 1,000

The preamble suggests that standards are not needed because the total number of deaths to expect is not large. But as a matter of basic fairness, no one should be expected to bear such risks just because he or she hasn't the "benefit" of many neighbors. Moreover, the figures above appear to be based on an "average" plant. In keeping with its precautionary mandate under

the Clean Air Act, EPA should be examining the risks to persons near the highest emitting facilities.

V. Coal-Fired Boilers

NRDC does not believe EPA has justified the decision not to propose standards for coal-fired utility and industrial boilers. We join in the comments of the Sierra Club and the Environmental Defense Fund on this subject, and add the following points.

If EPA's position is taken as a judgment that the risks from radionuclide emissions of coal-fired boilers are "de minimis," then the EPA analysis is fundamentally flawed. The reason is that the analysis is premised on average boiler emission rates. Under the precautionary mandate of the Clean Air Act, EPA is obliged to consider the plants whose emissions create above-average risks. At least these should be regulated.7/

EPA should also take into account the fact that the particulate matter controls which would be used by boilers to curb radionuclide emissions would also produce other benefits. First, there would be substantial benefits just in terms of particulate matter removal. The Background Information Document reports (at p. 4.1-17): "A survey of current SIP limits shows that values of 43 and 86 ng/J are typical for stringent and less stringent states, respectively." (The document gives no specific information on how many states have "stringent" versus "less

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7/ We understand that a study of the radionuclide risks from the 20 highest-emitting coal-fired boilers is being done for EPA by Battelle. To our knowledge, at this time it has not been completed, and we obviously have had no opportunity to review it. NRDC hereby requests a copy of this report as soon as it becomes available and reserves the right to comment further on this matter after reviewing it.

stringent" limits.) Requiring existing boilers to meet a limit equivalent to the present NSPS would lower these emissions to 13 ng/J, or 3.5-fold and 7-fold, respectively. Thes particulate reductions would substantially help in meeting primary and secondary particulate matter National Ambient Air Quality Standards in particulate nonattainment areas. Such reductions would also bring substantial benefits in the form of improved visibility and reduced soiling. The soiling benefits alone could total hundreds of millions to billions of dollars annually.

In addition, such controls would curb emissions of the many trace metals and elements in coal-fired power plant emissions. Reproduced on the following pages are several tables from a 1977 Energy Research and Development Administration report[8/] which illustrate the range of metals and elements present in coals.

Several of the substances -- arsenic, beryllium, and mercury -- are already listed hazardous air pollutants. Arsenic and beryllium are carcinogens. Mercury is a potent neurotoxin. Yet no standards for emissions of these substances from boilers have been proposed or set.

Other substances found in coal -- e.g., cadmium, chromium, manganese, and nickel -- are under EPA review as potential hazardous air pollutants. Cadmium, chromium, and nickel are widely recognized to be carcinogens. Draft health risk

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8/ Oak Ridge National Laboratory, "Environmental, Health, and Control Aspects of Coal Conversion: An Information Overview" (ORNL/EIS-94), prepared for ERDA (April 1977).

Table 2.20. Trace element content of American coals (ppm in coal)

Element	Region			
	Northern Great Plains	Western Interior	Eastern Interior	Appalachian
Beryllium	1.5	1.1	2.5	2.5
Boron	116	33	96	25
Titanium	591	250	450	340
Vanadium	16	18	35	21
Chromium	7	13	20	13
Cobalt	2.7	4.6	3.8	5.1
Nickel	7.2	14	15	14
Copper	15	11	11	15
Zinc	59	108	44	7.6
Gallium	5.5	2.0	4.1	4.9
Germanium	1.6	5.9	13	5.8
Molybdenum	1.7	3.1	4.3	3.5
Tin	0.9	1.3	1.5	0.4
Yttrium	13	7.4	7.7	14
Lanthanum	9.5	6.5	5.1	9.4

Source: Zubovic 1975, Table 2, p. 11 A.

Table 2.21. Distribution of environmentally hazardous trace elements (ppm in coal)

Element	Region			
	Powder River Basin	Western Interior	Eastern Interior	Appalachian
Antimony	0.67	3.5	1.3	1.2
Arsenic	3	16	14	18
Beryllium	0.7	2	1.8	2.0
Cadmium	2.1	20	2.3	0.2
Mercury	0.1	0.13	0.19	0.16
Lead	7.2		34	12
Selenium	0.73	5.7	2.5	5.1
Zinc	33		250	13

Source: Zubovic 1975, Table 3, p. 12 A.

Table 2.22. Mean analytical values for 101 coals

Constituent	Mean	Standard deviation	Min	Max
Arsenic, ppm	14.02	17.70	0.50	93.00
Boron, ppm	102.21	54.65	5.00	224.00
Beryllium, ppm	1.61	0.82	0.20	4.00
Bromine, ppm	15.42	5.92	4.00	52.00
Cadmium, ppm	2.52	7.60	0.10	65.00
Cobalt, ppm	9.57	7.26	1.00	43.00
Chromium, ppm	13.75	7.26	4.00	54.00
Copper, ppm	15.76	8.12	5.00	61.00
Fluorine, ppm	60.94	20.99	25.00	143.00
Gallium, ppm	3.12	1.06	1.10	7.50
Germanium, ppm	6.59	6.71	1.00	43.00
Mercury, ppm	0.20	0.20	0.02	1.60
Manganese, ppm	49.40	40.15	6.00	181.00
Molybdenum, ppm	7.54	5.96	1.00	30.00
Nickel, ppm	21.07	12.35	3.00	80.00
Phosphorus, ppm	71.10	72.81	5.00	400.00
Lead, ppm	34.78	43.69	4.00	218.00
Antimony, ppm	1.26	1.32	0.20	8.90
Selenium, ppm	2.08	1.10	0.45	7.70
Tin, ppm	4.79	6.15	1.00	51.00
Vanadium, ppm	32.71	12.03	11.00	78.00
Zinc, ppm	272.29	694.23	6.00	5,350.00
Zirconium, ppm	72.46	57.78	8.00	133.00
Aluminum, %	1.29	0.45	0.43	3.04
Calcium, %	0.77	0.55	0.05	2.67
Chlorine, %	0.14	0.14	0.01	0.54
Iron, %	1.92	0.79	0.34	4.32
Potassium, %	0.16	0.06	0.02	0.43
Magnesium, %	0.05	0.04	0.01	0.25
Sodium, %	0.05	0.04	0.00	0.20
Silicon, %	2.49	0.80	0.58	6.09
Titanium, %	0.07	0.02	0.02	0.15
Organic sulfur, %	1.41	0.65	0.31	3.09
Pyritic sulfur, %	1.76	0.86	0.06	3.78
Sulfate sulfur, %	0.10	0.19	0.01	1.06
Total sulfur, %	3.27	1.35	0.42	6.47
Sulfur by X-ray fluorescence, %	2.91	1.24	0.54	5.40
Air-dry loss, %	7.70	3.47	1.40	16.70
Moisture, %	9.05	5.05	0.01	20.70
Volatile matter, %	39.70	4.27	18.90	52.70
Fixed carbon, %	48.82	4.95	34.60	65.40
Ash, %	11.44	2.89	2.20	25.80
Btu/lb	12,748.91	464.50	11,562.00	14,362.00
Carbon, %	70.28	3.87	55.23	80.14
Hydrogen, %	4.95	0.31	4.03	5.79
Nitrogen, %	1.30	0.22	0.78	1.84
Oxygen, %	8.68	2.44	4.15	16.03
High-temperature ash, %	11.41	2.95	3.28	25.85
Low-temperature ash, %	15.28	4.04	3.82	31.70

Source: Ruch, Gluskoter, and Shimp 1974, Table 5, p. 18.

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assessment documents were recently completed for manganese and nickel.

At this stage, EPA must consider the benefits of particulate matter control and the total risk posed by emissions of the four listed hazardous pollutants (radionuclides, arsenic, beryllium, and mercury) from boilers. Now that EPA is directly reviewing the need for additional particulate matter controls for boilers, reasoned decision-making requires that the Agency consider at least all the pollutants it has already designated injurious to public health and welfare.

As a matter of sound policy-making, EPA should also consider the total risk posed by all the other trace metals and elements which have not yet been listed.

Without a comprehensive analysis of the risks from the hazardous pollutants in coal-fired boilers' particulate emissions, EPA is in no position to declare the risks "de minimis" and exempt this category of sources from control regulations.

Finally, NRDC believes the estimates of control costs presented in the preamble are grossly exaggerated. The capital costs of the entire acid rain program to control sulfur emissions, now pending before Congress, will cost less than the $15 billion capital cost for utility boilers estimated here. No data to support these cost estimates is presented in the Background Information Document.9/

9/ NRDC has not yet been able to review the referenced study, but intends to do so soon.

Conclusion

What EPA has proposed thus far does not protect the public health from the dangers of radionuclide emissions. NRDC submits that EPA must abandon its current BAT/"unreasonable residual risk" amalgam, which is contrary to the mandate of the Clean Air Act. In its place, EPA should apply the standard-setting criteria discussed in Section II of these comments. In addition, NRDC believes EPA must reconsider the specific proposals it has made, and the specific decisions not to regulate, in light of the comments offered in Sections III-V.