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March 23, 1987

87-RF-1831

The Honorable Timothy Wirth
The United States Senate
Washington, D.C. 20510

QUESTIONS REGARDING PROPOSED TRIAL BURN OF MIXED HAZARDOUS AND RADIOACTIVE WASTE AT ROCKY FLATS

Dear Senator Wirth:

In response to your letter of March 4, 1987, containing questions on the proposed trial burn of mixed hazardous and radioactive waste at Rocky Flats, we are attaching a detailed question-by-question reply.

You may be assured that our concern for safety of the public and the environment, as well as our employees, is of paramount consideration in our plans for the trial burn of the fluidized bed incinerator.

Do not hesitate to contact us should you need clarification of any of the provided information or have further questions.

Respectfully yours,

Dominick J. Sanchini
President

Enc.

ROCKY FLATS'
RESPONSE TO WIRTH QUESTIONS

The Trial Burn

1) Recent press reports indicated that Rockwell International has decided to use plutonium instead of uranium in at least part of the trial burn, in an effort to more accurately reflect the wastes that would be burned in an ongoing incineration program. What would be the physical nature of the plutonium in the trial burn? What quantity of plutonium would be burned, and what would be its highest level of radioactivity and isotopic distribution?

Response:

Fluidized Bed Incinerator Proposed Verification Plan

Run #	Type	Waste Rate Per Run (lbs/hr)	Total Waste Per Run (lbs)	CCl_4 Per Run (lbs)	Uranium Lbs	Pu Lbs	Weight %	Air Concentration Bldg Exit (pCi/m3)	Air Concentration Plant Bound (pCi/m3)
1	Liquid	36	144	7.2					
2	Liquid	60	240	12					
3	Liquid	80	320	16	0.54		0.17	2×10^{-11}	2×10^{-15}
4	Solid	150	600	12	1.02		0.17	4×10^{-11}	4×10^{-15}
5	Solid	105	420	8.4		6×10^{-4}	1.4×10^{-4}	5×10^{-9}	4×10^{-13}
6	Solid	105	420	8.4		6×10^{-4}	1.4×10^{-4}	5×10^{-9}	4×10^{-13}

The plutonium additions are the maximum allowed as low level waste, i.e., 100 nanocuries transuranics per gram of waste. In actual operation, the plutonium content will actually be approximately 0.3 nanocuries plutonium per gram of waste, or 4×10^{-7} weight percent.

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The physical form of the plutonium in trial burn run Numbers 5 and 6 will be a solution of plutonium nitrate. The plutonium addition will be National Bureau of Standards grade plutonium -239.

2) Is Rockwell still planning to also use uranium in at least part of the trial burn? If so, what would be its chemical form and isotopic distribution? What quantity of uranium would be burned, and what would be its highest level of radioactivity?

Response: Rockwell does plan to use uranium in two of the trial burns. It will be in the form of a solution of uranium nitrate. Depleted uranium will be used in the trial burn runs. Naturally occurring uranium contains approximately 0.7% U235 (a fissile isotope) and 99.3% U238 (a non-fissile isotope). Depleted uranium contains < 0.3% U235. See table in Question 1 for amounts of radioisotopes to be added to trial burn runs.

3) The key element of the composite waste which Rockwell intends to burn in the test, known as the principal organic hazardous constituents (POHC), is carbon tetrachloride (CC14). Carbon tetrachloride was selected to serve as the POHC, according to the proposal, because of its high ranking on the Environmental Protection Agency's heat of combustion hierarchy. What assurances do you have that the results of burning CC14 will, in fact, serve to project the results of burning every conceivable hazardous organic substance that will be involved in the incineration program?

Response: Based on a thorough evaluation of all possible waste forms to be incinerated, carbon tetrachloride has the chemical stability characteristics that make it the substance of choice. It is the most difficult substance to incinerate because of its strong chemical bonding. (Reference 40 CFR 261, Appendix VIII,

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Ranking of Incinerability and the EPA Guidance Manual for Hazardous Waste Incinerator Permits.) When compared with the principal organic hazardous constituents (POHC) which will be routinely incinerated, CCl_4 is the highest ranking POHC which will be incinerated during the operational phase.

4) The carbon tetrachloride mixture to be used in the trial burn is listed as having 10 percent weight and 19 percent volume. Yet the organic waste oil sample in Table 9 ("Wastes Scheduled for Destruction in FBI") is listed as including CC14 of 10 to 50 percent volume, which would make it more difficult to burn. How do you reconcile this discrepancy with the need for the trial burn to replicate an actual burn?

Response: The feed analysis completed prior to every run will assure there will be no greater than 10% (w) of carbon tetrachloride in the feed stream. The organic liquids will be collected in a holding tank and thoroughly agitated before sampling. The addition of 4 liters of the 10 - 50% CCl_4 waste comprises a very small part of the estimated 3400 liters of organics collected per month.

5) Are the other liquid and solid materials that would make up the composite trial burn waste representative of the actual wastes to be burned in an ongoing incineration program? In particular, the composition of the trial burn solid waste consists of uranium, CC14 and paper product (Kimwipes). Yet the actual wastes planned for incineration include clothing, latex and plastics in addition to Kimwipes. Please explain how the results of burning paper can accurately predict the results of burning substances such as latex and plastic.

Response: In general, the heat content of the paper and plastic waste feed material for the verification run is representative of the actual waste. They are typical of the cellulosics (non-halogenated hydrocarbons) utilized on plantsite.

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6) As one of the "expected permit conditions," the proposal lists a maximum organic chlorine content of 18 percent weight. However, Table 9 (Wastes Scheduled for Destruction in FBI) lists a number of wastes with significantly higher chlorine content. Please explain the discrepancy.

Response: The estimated total volume of liquid waste generated per month is 3400 liters. This is a combination of all the liquid waste identified in Table 9. The high chloride streams indicated in Table 9 are only a small portion of the waste volume which is combined in feed tanks before sampling and incineration.

The feed analysis completed prior to every run will assure no greater chloride content than specified in the permit conditions. (See answer to Question No. 4.)

7) Please provide more information about the two-tier system designed to measure the carbon dioxide concentration in the gas emissions, and, in the event the carbon dioxide levels indicate a low level of combustion, to automatically cut off the waste feed. Specifically, what are the upper and lower carbon dioxide levels, in both the trial burn and ongoing incineration program, that would trigger a cut off? How long a time period is the "moving time window."

Response: The two-tier system is designed to provide waste feed cut-off caused by a CO spike or a drop in CO_2. The precise data values for cut-off (between 2000 and 6000 ppm CO and 6 to 20% for CO_2) will be determined during the trial burn. A waste feed shutdown will occur immediately after detection of carbon dioxide or carbon monoxide levels outside the values specified in the permit. The "moving time window" is a time delay which will allow the system to correct for out-of-tolerance spikes of CO and CO_2. The planned "moving time window" is 30 seconds, after which the system feed will shut down if not corrected.

8) In the discussion on pollution control, the proposal indicates that halogens, halogen acids, sulfur dioxide and phosphorous

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pentoxide are removed by chemical reaction with sodium carbonate in the primary reactor. Yet the primary reactor is only 25 percent efficient, and no sodium carbonate is present in the secondary reactor. Please explain how the hazardous substances that survive the primary reactor will be destroyed.

Response: Although only 25% of the combustion process occurs in the primary bed, virtually all of the chemical reaction with chlorides or other halogens is completed here. The combustion process for carbonaceous and hydrogenous material is completed in the afterburner.

The on-going incineration program

9) The proposal details the hazardous substances that would be burned in an active incineration program, but gives no indication of the specific radioactive substances that would be burned. Please provide a list of those specific liquid and solid radioactive substances.

Response: The solid waste to be incinerated is contaminated with depleted uranium.

The liquid wastes listed in Table 9 are contaminated with depleted uranium (typically 3×10^{-2} g/l).

Plutonium concentrations in liquid waste are extremely low (maximum $4. \times 10^{-6}$ g/l; average $< 2.6 \times 10^{-6}$ g/l).

10) What amounts of mixed hazardous and radioactive wastes -- both liquid and solid -- do you propose to burn in a calendar year? How many burns would be conducted per year? What amount of wastes would be incinerated in each burn?

Response: The yearly waste generation estimate is:

11,000 gallons of liquid waste;
7,000 cubic feet of solid waste.

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These estimates do not include the estimated backlog as of 7/87, which is:

26,000 gallons of liquid waste;
1,500 cubic feet of solid waste.

The expected incinerator useage at a nomimal 80% operation time:

Initially, to work off backlog: 30 weeks;
and, when caught up: 9 days per month.

Approximate amount of waste incinerated per burn:

460 gallons of liquid waste per burn;
290 cubic feet of solid waste per burn.

Both solid and liquid wastes will be incinerated during each burn period.

11) What danger exists that new hazardous products -- known as "products of incomplete combustion" -- would be created during the incineration program?

Response: Products of incomplete combustion will be identified through analyses of the trial burn ash and offgas samples. Table 7 of the Trial Burn Plan identifies the variety of parameters possible in these runs due to incomplete combustion. Results of the PCB Trial Burn in 1981 showed excellent destruction results, i.e., a destruction and removal efficiency (DRE) of 99.99997%.

Emissions and ash

12) I understand the fluidized bed incinerator technology is fairly advanced and efficient, but that it also produces a large amount of particulates. The multi-stage filtration process, according

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to the proposal, would remove 99.97 percent of the particulates down to 0.3 micron size. What percentage of the particulates produced in the incineration process are smaller than 0.3 microns in size? What percentage of those particulates escape as part of the emissions? What is the physical makeup of those emissions?

Response: A minimum of five stages of High Efficiency Particulate Air (HEPA) filters will be used to filter particulates from the FBI air effluent prior to its exiting the building. Each of the HEPA filters is individually tested and certified to provide a minimum filtration efficiency of 99.97%. Once installed, the HEPA bank is tested to assure a minimum filtration efficiency of 99.95%. For these calculations, it was assumed that the first bank of HEPA filters provides a filtering efficiency of 99.95% and that the subsequent four banks provide an efficiency of 99.8% each. The resulting HEPA filter reduction factor is 8×10^{-15}. This is consistent with the assumptions made in the EIS. The capturing efficiency of these filters is greater for particulates greater or smaller than 0.3 microns in diameter. The bulk of the emissions consists of CO_2,H_2O vapor and excess air.

13) How much radioactivity will escape as part of those small particulates? How much radioactivity will escape in a gaseous form?

Response: There will be no gaseous plutonium present in the incineration process because the boiling point of plutonium at standard atmospheric conditions is 3230°C and the incinerator operates at a temperature of 550°C. Furthermore, the plutonium will be in the form of plutonium oxide, which has an even higher boiling point, i.e., the vapor pressure of plutonium is essentially 0 at standard atmospheric conditions. Particulate releases have been calculated to be 0.1 quintillionths of an ounce of plutonium per ton of waste incinerated and a similar insignificant amount of uranium.

14) The proposal states that Rockwell will destroy any trial burn residual wastes in the incinerator if the trial burn "went

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smoothly" and preliminary analytical results are positive. As I understand this plan, it means that Rockwell would be burning the residual wastes before the final chemical analysis is completed and before an operating permit is granted. Please explain.

Response: There will be no incineration of waste until all analytical results have been evaluated and approved by the CDH.

Once approval of the analytical results is received from the CDH, waste will be incinerated under an interim status permit until a final permit is issued.

15) The proposal states that the amount of ash generated during incineration "is on the order of 7.75 kg/hr (17.1 lb/hr)." Does this total represent a combination of liquid and solid waste residue, or an average of the two?

Response: The 7.75 kg/hr (17.1 pounds/hour) ash generation rate is a nominal value over the six runs of solids and liquids incinerated during the trial burn.

16) What will be the hazardous and radioactive content of the ash left over from the incineration?

Response: The hazardous and radioactive content of the ash will be determined by analyses performed on trial burn samples. There should be < 0.0001 weight/percent hazardous constituents in ash per destruction and removal efficiency (DRE) of 99.9999%; however, regulations only require a DRE of 99.99%. The radioactivity in the feed will accumulate in the ash.

17) What process will be used for disposal of that ash, and where will it be disposed?

Response: Presently, the plan is to cement the ash. The cemented ash will be stored at Rocky Flats Plant until a mixed waste disposal facility is permitted to receive this waste.

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PCB trial burn

18) The proposal cites a trial burn of polychlorinated biphenyls (PCBs) conducted in 1981 in the Rocky Flats' pilot fluidized bed incinerator. Did that PCB trial burn successfully comply with the limits set forth by the Toxic Substances Control Act (TSCA) regulations? Have PCBs been subsequently burned at Rocky Flats, and are they presently being burned at the plant?

Response: Yes, the PCB trial burn complied with the limits set by the Toxic Substance Control Act regulations. The TSCA regulations require a DRE of 99.9999% for PCB. The Rocky Flats test burn demonstrated a DRE of 99.99997%. No PCBs have subsequently been burned nor are presently planned to be burned at the Rocky Flats Plant.

Monitoring:

19) According to the proposal, the flue gas from the incinerator will be monitored for radioactivity emitted from the uranium (and presumably the plutonium, if used). To accurately determine how effective the filters are -- and whether a "mass balance" has been achieved -- is it not also essential that incoming waste feed and outgoing ash be monitored for radioactivity? What provisions will be made to ensure that such complete monitoring occurs?

Response: The effectiveness of the filtration system will be demonstrated by the radioactivity results from particulate analyses and the continuous radioactive monitoring system.

The waste feed, ash and offgas from the trial burn will be analyzed for radioactivity. These analyses are specified in the trial burn plan.

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20) Who will actually monitor the emissions from the trial burn and the regular incineration program? Will the effectiveness and calibration of the monitoring equipment be independently checked by the Colorado Department of Health or other independent entity? Will an independent representative be permitted to observe the actual monitoring?

Response: Radioactive emissions for both the trial burn and the regular incineration program will be monitored by the Health, Safety and Environment Department of Rockwell International and the CDH. These emissions will be reported at the monthly state exchange meeting. CDH can check calibration performance, but will not actually do the calibration. All aspects of the Trial Burn will be witnessed by CDH and the EPA.

Options

21) What options exist for conducting the trial burn at a more remote site away from populated areas?

Response: The purpose of the trial burn is to demonstrate that this particular incinerator will destroy the hazardous material in waste and reduce the waste volume, producing a stable ash. Therefore, the trial burn cannot be conducted at another site. Even if there were another DOE site which had an FBI, and they would consent to incinerating RF mixed waste the Department of Transportation (DOT) regulations are so restrictive for the shipment of radioactive liquids, that this is also an unrealistic option.

22) What other technologies are available for the incineration of toxic wastes? Have you evaluated those technologies as alternatives to the fluidized bed/multi-stage filtration system?

Response: There are other technologies available for the incineration of toxic wastes. However, the fluidized bed incinerator-/multi-stage filtration system is an excellent technology which

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has already demonstrated its detoxification and particulate filtration capabilities. It is ideally suited for destruction of hazardous chemicals. Other incineration technologies, e.g., rotary kiln, controlled air, agitated hearth, fixed hearth, etc., require a liquid scrubber system to capture HCl or any other halogen acids generated. The scrubber solution then becomes a secondary waste which must be treated to produce a solid waste form.

Post-trial burn

23) What is the timeframe for evaluating the trial burn results? Would there be a second comment period before the incineration program begins? At which point in the process will a public hearing be scheduled?

Response: Approximately two months are planned for the analysis and State review of the results to assure the effectiveness of this controlled incineration process before any waste is incinerated. Another public hearing is required before the final permit is issued.

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