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City Councilor,  
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Secretary Peter Maggiore  
New Mexico Environment Department  
1190 St. Francis Drive, Santa Fe  
hand-delivered

Dear Mr. Secretary,

I have a Ph.D. in Physics from Cornell University, and I am currently a Research Professor at the Santa Fe Institute. I mention this for identification purposes only; these comments do not represent the Institute's views.

Some of my expertise on the technology I address in this Comment comes from working for my father's company, Bio-Imaging Research, designing user interfaces for industrial x-ray scanners. This has given me an opportunity to become familiar with the issues of energy levels, detection, and image processing in radiography and computed tomography.

I am also a City Councilor in Santa Fe, and have followed the debate about WIPP with great interest. Although I am not speaking here on behalf of the City, I believe I am speaking for the interests of my constituents.

Quite frankly, I have grave concerns about WIPP overall. I would prefer that we use monitored, on-site storage, taking the time to characterize the waste carefully and keep it in leak-proof containers. Although the direct risk from transporting WIPP waste may be quite small --- less than a gasoline tanker, in fact --- WIPP sets a precedent that may be used for more dangerous waste in the future.

However, if WIPP is going to move forward, it's vital for it to be done as safely as possible. My comment concerns one important element of that safety: the scanning technology used to characterize the waste.

All parties benefit from the best possible information. Disputes between WIPP advocates and opponents about the nature and content of WIPP waste should be resolved with good engineering and accurate scanning.

However, it seems to me that the current permit actually prevents DOE from using the best available technology. By stipulating the use of real-time, low-energy radiography, it prevents computed tomography in the 1 to 2 MV (1000 to 2000 kV) range. Higher energy x-rays can penetrate the sludge in WIPP barrels and give much sharper images of the contents, allowing the operator to more accurately classify the contents by their density.

(Needless to say, x-rays are not charged or massive particles, and 1 to 2 MV is not nearly high enough energy to induce additional radioactivity in the sample, so WIPP opponents should have no objection to this technology.)

Computed tomography also allows for a three-dimensional picture of the barrel's contents that can be evaluated in a much more detailed way than a two-dimensional view on a screen. Objects can be highlighted by their density, medium-density objects can be distinguished from high-density objects surrounded by a low-density core, an object's internal structure can be distinguished by taking cross-sections at any desired level or angle, and so on.

(over)



On the other hand, real-time radiography at the 160 to 450 kV levels cited in the permit will show nothing but an opaque mass in many cases. The current permit then mandates a visual inspection, which endangers the operator's health and safety, and may still not give an accurate characterization of the waste. How does a visual inspection allow an operator to discern the composition of an object, or its internal structure? Waste is sometimes contained in smaller lead containers inside the barrels, and the operator would have to actually cut these smaller containers open to inspect the waste. High-energy computed tomography can see through such containers, making opening them unnecessary.

Therefore, I would suggest the following amendments to the permit. These amendments would give DOE the option of using a full range of technology, to give the most accurate possible characterization.

. Modify line 9 on page B.11 to begin "Radiography (including computed tomography) is a nondestructive . . ."

. Either eliminate the paragraph starting on line 40 of page B.11, or replace the three sentences by "The Permittees will use real-time radiography or computed tomography for container analysis. If other methods are developed, permit modifications will be sought for their inclusion. The quality assurance, quality control, and training requirements established for RTR and CT will apply to any newly developed methods."

. On page B.12, replace the phrase "radiography and/or VE... " with "radiography, computed tomography, and/or VE... " on lines 16, 18, and 19.

The above three amendments make computed tomography an option; the current language appears to exclude it.

. On page B1.19, modify the text starting on line 30 to read "It should be possible to vary the voltage, typically between 150 and 420 or 450 kilovolts (kV) in some types of equipment, and 1 or 2 MV in other types of equipment, to provide the optimum degree of penetration through the waste."

This gives the operator a maximum degree of flexibility in using an energy appropriate to the waste.

. Modify the sentence on line 35 of page B1.19 to read "The imaging system may utilize a fluorescent screen and low-light television camera, an x-ray sensitive image intensifier, or solid-state x-ray detection devices."

This allows solid-state detectors to be used, which are standard in high-quality scanning equipment and are much more sensitive than fluorescent screens or image intensifiers.

. Modify the sentence at the end of the paragraph, starting on line 6 of page B1.20 to read "Containers with lead liners, sludge, cement, or other containers whose contents prevent full examination of the remaining contents on systems whose maximum voltage is 420 kV or 450 kV shall be examined using more penetrating 1 to 2 MV radiation. If it is still not possible to discern their contents, they shall be subject to visual examination."

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This allows for a higher-energy scan before going to a potentially dangerous and subjective visual inspection.

Thank you for considering these amendments, and for making it possible for DOE to use the best --- and safest --- available technology for characterizing WIPP waste.



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GARY JOHNSON  
GOVERNOR

MARK E. WEIDLER  
SECRETARY

*Steve Z -  
looks like a  
good comment which  
should be approved  
Benito  
8/14/98  
Steve please get original  
from John McKay*

Date: 8/12/98

To: Benito Garcia

Fax: 7-1544

Phone:

Pages: 4

From: John McKay

Fax: 505-827-2836

Phone: 505-827-2855

Comments:

*Benito -*

*We received this comment regarding the WPP Draft Permit  
this morning. Please let me know if you would like  
the original for your records.*

*Thanks,  
John*

**fax**

T R A N S M I S S I O N